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CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

No. 53

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USSR REPORT

Cybernetics, Computers and Automation Technology

No. 53

Contents

 [III - USSR - 21C S&T]

UDC 681.3.01:51

SMALL SPECIALIZED DIGITAL COMPUTER WITH HIGH THROUGHPUT FOR SYSTEMS THAT COLLECT AND PROCESS MEASURING INFORMATION

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 2, 1980 signed to press 21 Mar 80 pp 29, 34

[Article by M. Yu. Klyashtornyy, V. A. Pronin, V. B. Smolov and S. T. Khvoshch in the section "System Hardware and Auxiliary Equipment"; received by editors 21 Jun 79 (after revision 29 Nov 79)]

[Excerpts] Introduction. The widespread introduction of modern computer hardware into measuring information acquisition and processing systems has complicated and expanded their functions. The problems in adapting the structure and software of specialized digital computers to the conditions of their use in measuring information systems are analyzed in this work. The example of on-board systems that collect and process flight information (BSSO) is used in the presentation [1].

Structural Design of the Digital Computer. The processor for the specialized computer is made in the form of two cassettes; each cassette contains four boards bonded in pairs with dimensions of 155 x 205 mm. The bonded boards are combined into a "book" by a loop cable. Each bonded board contains 120-160 packages of integrated microcircuits and has two 35-pin connectors. Thus, the cassette may have up to 320 packages of microcircuits and has 140 external leads.

Memory units with a capacity of 2048 16-bit words each have also been realized in the form of similar cassettes. The dimensions of the cassette are 155 x 205 x 20 mm and the weight is about 0.4 kg.

Various memory capacities can be accumulated by connecting various quantities of cassettes into a rack. The specialized digital computer with a memory capacity of 4K-words ZUP [program storage] and 2K-words ZUO [operand storage] contains five cassettes and weighs about 8 kg (with case and power supply).

Conclusion. By combining operations, adapting the system of commands to the peculiarities of the algorithms being processed and selecting a suitable structural design, a small specialized digital computer meeting all requirements of the international standard was built with medium throughput elements. The digital computer can be successfully used as a component of various on-board collection and processing systems which will have higher quality as a result [1].

[330-8545]

8545
CSO: 1863

ELEKTRONIKA S5-11 MICROCOMPUTER DESIGN DESCRIBED

Moscow MIKROPROTSESSORY I MIKRO-EVM in Russian 1980 pp 2, 51-55

[Annotation and excerpt of the text of the book "Microprocessors and Microcomputers" by A. V. Shileyko, Izdatel'stvo "Znaniye", 52,200 copies, 64 pages]

[Text] Annotation

The advent of sophisticated and affordable microprocessors fundamentally altered our ideas about the potentials of computer technology. This booklet, intended for a broad range of readers, describes what microprocessors and microcomputers are, the causes that brought them into being, and the potentials of their use.

pp 51-55

The Elektronika S5-11 microcomputer consists of the following basic units:

a microprocessor;

the main memory (OZU) with a capacity of 128 16-bit words;

a permanent memory (PZU) with a capacity of 1,024 16-bit words;

an input-output unit; circuits producing synchronizing signals for all of the microcomputer's units.

The microprocessor contains:

six K 536IK1 microcircuits forming three 16-bit arithmetic units;

a K 536IK2 microcircuit providing microprogram control;

four K 535RYe2 microcircuits forming the microprogram memory with a capacity of 1,024 32-bit words.

The word "microprocessor" is used here in a somewhat different meaning from that used above. A microprocessor is redefined here as a microprocessor

outfit consisting in this case of 11 crystals (microcircuits) of three different types. However, other microcircuits within the composition of the OZU, PZU, the input-output unit, and so on are not in the microprocessor outfit in this case.

The OZU includes four K 535RU2 microcircuits, each one of which can store 64 8-bit words. Two microcircuits make up an OZU capable of storing words 16 bits long, and the other two microcircuits increase the total capacity of the OZU to 128 words.

The 16-bit PZU, which has a capacity of 1,024 words, is built out of two K 535RYe2 microcircuits. Each microcircuit is capable of storing words eight bits long.

The input-output unit makes use of four K 536OR1 microcircuits. The input-output unit forms 32 digital inputs and as many outputs to permit the microcomputer's connection to peripheral units. One of the microcircuits may be used to organize a program interruption system. The functions of central input-output control are performed by three K 536IKZ microcircuits, each of which is capable of working as a data exchange register with the microcomputer, or as an address register with a decoder.

Internal interfacing of the microcomputer is achieved with K 536UYe1 microcircuits--bus power amplifiers making it possible to transmit information in two directions on one bus between several sources and receivers. Such is the complete list of microcircuits (crystals) used in the microcomputer.

All of the microcomputer units listed above are interconnected by the following four multidigit lines:

address line (15 conductors);

two-way information line (16 conductors);

conditions line (4 conductors);

microinstruction line (32 conductors).

The structural organization of the microprocessor foresees the presence of three independent logical arithmetic units (ALU's), each of which processes words 16 bits long and correspondingly consists of two microcircuits. The first ALU is intended basically to process instructions, the second is intended to store and process digital information, and the third, a supplementary ALU, is used in work with bytes as well as to speed up the work of the microprocessor. It should be noted here that this central processor structure is highly typical of modern microcomputers.

The entire microcomputer described here is assembled on a single board which together with its housing has 267 × 270 × 38.5 mm dimensions. Total

power consumed does not exceed 15 w, and total weight is 1.2 kg. These figures speak for themselves. On the other hand, were we to possess three independent ALU's, we could not only significantly increase the speed of the microcomputer but also, what is perhaps more important, we could significantly simplify the structure of computation control.

A second interesting feature of the Elektronika S5-11 microcomputer is utilization of the principle of microprogram control in the central processor. As was noted earilier, the microprocessor includes a microprogram control unit and a memory for microprograms. The structure of the ALU's BIS's [large integrated circuits] is selected in corresponding fashion. These BIS's are controlled only by special signals which have come to be called microcommands. The microcomputer can be concurrently controlled from without by means of conventional instructions. In all, it can handle 256 different instructions, together with their modifications.

Here is one more interesting feature. In distinction from, for example, the 8080 central processor, the ALU does not contain general registers. Instead, the OZU is connected directly to the ALU, making it possible to exchange information very quickly between the ALU and OZU. As a result any of the OZU's 128 cells may be used as a general register. Clearly this affords many additional advantages, the main one being simpler organization of the computation process.

And now the last remark. We turned our attention several times above to the fact that when BIS's are used in modern computers as the principal structural units, the interconnecting leads of the BIS housings are the main source of unreliability in the work of the electronic apparatus. The opinion has been stated in this connection that out of two equivalent designs, that which contains fewer BIS's and, consequently, a smaller quantity of interconnections, is generally speaking better. This raises a natural question. The processor of the Elektronika S5-11 microcomputer uses 11 microcircuits, in comparison with the one in the MCS-80 microcomputer. Are there grounds for asserting that our Elektronika should be less reliable for this reason?

Let us begin the answer to this question with the fact that the Elektronika operates with words of doubled length. Therefore for comparison purposes the quantity of microcircuits would have to be halved. Still, the ratio is five against one! Of course, such an increase in the quantity of microcircuits would produce a certain decline in reliability, were we to additionally consider that each of them has 48 leads. However, this decline may be more than compensated by the fact that the simpler structure of the computation process would make it possible to significantly simplify all of the possible diagnostic procedures. In short, the situation boils down to the following. The probability of failure in the Elektronika is greater, but this failure is much easier to detect and correct. Consequently assuming the presence of diagnostic programs--and all modern microcomputers are mandatorily supplied with such programs--the Elektronika would in the end be found to be more reliable.

[316-11004]

11004
CSO: 1863

UDC 62-52:681.3.06.2

BASIC CHARACTERISTICS OF INPUT LANGUAGE FOR AN INTERACTIVE MULTITERMINAL SYSTEM

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 2, 1980 signed to press 21 Mar 80 p 65

[Article by G. P. Ostapenko in the section "Common Software for Control Systems"; received by editors 3 Jul 79]

[Excerpt] The interactive multiterminal system (DIAMS), developed for the SM EVM [system of small computers] with main-line architecture, is designed to solve problems of automation of control in administrative type ASU [automated control systems], in systems of automation of scientific experiments (SANE), in the field of automation of design, etc. The system is based on facilities for informational-logical processing of data, built on the principles of a data base management system (SUBD) and having the capability of operating with a graphic display [1] and with KAMAK [expansion unknown] apparatus [2].

Up to 40 users can operate simultaneously with the interactive multiterminal system depending on the hardware composition. Each user or group of users has a special user identification code (KIP) which permits working with both autonomous and shared data bases with a total capacity of up to 200M bytes. Each user identification code is associated with one's own catalog of programs (catalog of user programs). System and library programs come under the system administrator's user identification code.

Any of 64 terminals may access the system, including remotes connected through a telecommunications adapter.

The system input language is a high-level interpretative type, specially oriented to creating and working with data bases (BD). The system is completely resident in OZU [main memory] and therefore provides relatively fast response. Only data and user programs are stored on VZU [external storage units]. In addition, the key words in the input language were

chosen in such a way that they are identified by the interpreter by their first character. This also speeds up the interpretation process considerably.

The basic features of the input language for the interactive multiterminal system are discussed below.

[330-8545]

8545
CSO: 1863

ABSTRACTS FROM THE JOURNAL 'CONTROL SYSTEMS AND MACHINES'

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 2, 1980 signed to press 21 Mar 80 pp 145, 147, 149, 151

UDC 621.394.74

NETWORK MEASUREMENT SERVICE. FUNCTIONS AND METHODS OF SOFTWARE ORGANIZATION

[Abstract of article by Glushkov, V. M.; Stogniy, A. A.; Kushner, E. F.; and Pan'shin, B. N.]

[Text] Problems in the development of the functional structure of the software for organization of system measurements in computer networks (setemetriya) are discussed. The components and methods of organization of software for accounting, monitoring and evaluating the efficiency of computer system operations are described and analyzed. Prospects for the development of network measurement facilities in the GSVTs [State Network of Computer Centers] are outlined. References 10.

UDC 681.3.06.41

SIMULATOR FOR COLLECTIVE-USE COMPUTER CENTER WITH EXTENSIVE SUBSCRIBER NETWORK

[Abstract of article by Zaychenko, Yu. P.; Tomashevskiy, V. N.; and Gnatovskiy, V. N.]

[Text] A simulator for a collective-use computer center with an extensive subscriber network was developed, it has a fairly high degree of versatility which allows study of the modes of operation of the center in a broad range of structures. The simulator was realized in the ALSIM-BESM simulating system. Simulation results are given. Figures 3, tables 1, references 5.

UDC 681.3.06.4

ON ONE MODEL OF A TWO-LEVEL AUTOMATED DATA PROCESSING SYSTEM

[Abstract of article by Yegipko, V. M.; Akimov, A. P.; and Gorin, F. N.]

[Text] Problems in analysis of a two-level subsystem of an automated data processing system are discussed. The operation of this subsystem is represented as a joint functioning of two information processing devices with differing throughput. A set of statistical and dynamic characteristics of the subsystem is defined. Figures 3, tables 1, references 6.

UDC 621.394.74

DEFINITION OF PARAMETERS OF DATA TRANSMISSION PROCESSES IN A "PERIPHERAL NETWORK-AUTOMATED ENTERPRISE MANAGEMENT SYSTEM COMPUTER COMPLEX" SYSTEM WITH REGARD TO HARDWARE-SOFTWARE REALIZATION OF COMPLEXES

[Abstract of article by Kozhevnikov, Yu. S. and Shchennikov, Yu. F.]

[Text] A technique for determining the parameters of a multimachine computer complex of an ASUP [automated enterprise management system] is described. The parameters for hardware-software realization of the complex and its architectural solution are taken into account. Calculated curves are given which enable one to select the type of hardware and to define delays in processing information arriving from the peripheral network of the ASUP. Figures 3, references 3.

UDC 681.3.29./16

ON ONE MODEL OF MEMORY USE DURING SIMULATION

[Abstract of article by Litvinov, V. V. and Shevchenko, S. N.]

[Text] A model of the process of dedicating and emptying the message memory in programs written in the classic simulation languages is discussed. Based on this model, a procedure is described to estimate memory use. References 8.

UDC 681.3.007

ESTIMATING JOB COMPUTING COSTS AT SHARED COMPUTER CENTERS

[Abstract of article by Kovalenko, V. V.; Parkhomenko, V. L.; and Khmara, M. T.]

[Text] Problems in estimating costs for computer operations at shared computer centers are discussed. The solution to these problems enables raising the accuracy of mutual settlement under the conditions of an

uneven load on the center. Mutual settlement in accordance with resources actually used encourages efficient use of software and hardware. Tables 1, references 4.

UDC 658.012.011.56:658.3-05.012.12.007.2

TRAINING OF ENGINEERS-SYSTEM ORGANIZERS FOR AUTOMATED MANAGEMENT SYSTEMS

[Abstract of article by Ogullo, V. D. and Kudryashov, Yu. P.]

[Text] The problem of ASU design integration is analyzed. The concept of ASU system interface as a documented multilateral agreement on links between all the heterogeneous ASU elements is introduced. The conclusion is drawn that the development of system interface should be performed by a new type of engineer --the system organizer. Major directions of curricula for the system organizers and the salient features of their training are given. Figures 1, references 7.

UDC 681.3.29./16

METHOD OF RECORDING DATA INTO MULTIAPERTURE FERRITE PLATE MEMORY

[Abstract of article by Yakovlev, Yu. S. and Novikov, B. V.]

[Text] An original method of recording data into multiaperture ferrite plate memory is described which enables raising the validity of data recording and shortening the access cycle. Figures 3, references 3.

UDC 681.3

SOME CORRELATIONS BETWEEN TIME PARAMETERS OF COMPUTER OUTPUT CHANNELS AND CHARACTERISTICS OF DISPLAY STRUCTURE

[Abstract of article by Davydov, A. A.; Lysyakov, Yu. M.; and Shurman, V. A.]

[Text] Correlations are considered between the time parameters of a computer output channel (response time, data transmission rate, and relative processor load) and characteristics of a display with incomplete memory of regeneration (memory capacity, information content, degree of image variety); the correlations make it possible to assess the structure and parameters of a display system in the process of synthesis. Figures 4, references 6.

UDC 681.3.51.007

METHOD OF ENHANCING SYSTEM FUNCTIONING EFFICIENCY WITH AN ADDITIVE EFFICIENCY INDEX

[Abstract of article by Smolyarov, A. M.]

[Text] A series of analytic expressions for calculating efficiency indexes for data processing systems is suggested. The problem of obtaining estimates of the efficiency index is reduced to analysis of the gain by making use of the priority for the greatest investment. The quantity of information per unit of time is assumed as the main factor. Figures 3, references 6.

UDC 681.3.06.4

MIR-2 BASED AUTOMATED WORK STATIONS FOR RADIO ELECTRONIC EQUIPMENT DESIGN ENGINEERS

[Abstract of article by German, V. A. and Lipshteynas, Ya. Ts.]

[Text] A radio electronic equipment (REA) design automation system is suggested which includes a central computer (YeS EVM) and five design-engineer automated work stations (ARM) based on the MIR-2 computer. Principles underlying software for peripheral computers are described. The most efficient operating conditions for the automated work stations are defined and based on more than three years system operating experience. Figures 1, references 4.

UDC 539.24./27

MODELS AND METHODS OF SOLUTION TO ONE CLASS OF DISCRETE OPTIMIZATION PROBLEMS IN AUTOMATING DESIGN OF LARGE SCALE INTEGRATED CIRCUITS

[Abstract of article by Kravets, V. L.]

[Text] A class of optimization problems of coating at the stage of the BIS [LSI] photomask design is studied. Combinatorial models of problems in this class are described. Methods for finding local optimal solutions to these problems are suggested. Figures 2, references 14.

UDC 681.3.51./6.42

GENERAL SYSTEM SOFTWARE OF UNIFIED SYSTEM OF COMPUTERS FOR DATA PROCESSING

[Abstract of article by Zaytsev, N. G.]

[Text] A description is given of the basic features of general system software (OSMO) representing an integral complex of a programming system and of a set of procedures for programming data processing problems. Information units being processed by general system software are considered. The composition of operations, macrofacilities and the technology of general system software programming are determined. The input language is given. Methods of programming based on this software are given. Tables 1, references 8.

UDC 681.3.06./94

MULTIPURPOSE INTERACTIVE SYSTEM

[Abstract of article by Nikitin, A. I. and Kuzik, I. I.]

[Text] The structure of the interactive system software and its operation on a BESM-6 computer are described. The system can be adjusted for various applications. Figures 2, references 7.

UDC 681.3.06./94

INTERACTIVE FACILITIES FOR ADAPTING OS-TEST TO HARDWARE OF MINICOMPUTER BASED SYSTEMS

[Abstract of article by Aleksandrova, A. F.; Ibragimov, K. Sh.; and Podzin, A. Ye.]

[Text] An interactive system for adapting the TEST operating system to an arbitrary composition of hardware is described. Characteristic of this system is the automatic compilation of a system of descriptor data for program-controllable parameters of the hardware units depending on user responses to questions in a special program written in the TEST language. Figures 3, references 3.

UDC 681.3.51./6.42

PROGRAM CONTROL OF MAGNETIC TAPE STORAGE

[Abstract of article by Pashchenko, S. N. and Pelipenko, N. I.]

[Text] A compact program for the start and execution of basic operations for control of magnetic tape storage is described. The most rational method for organization of calls to this program is discussed.

Recommendations for practical application of it are given. The program text is written in ASSEMBLER (YeS EVM), while the call text is written in PL/1. Tables 1, references 1.

UDC 62-52.681.3.06.44

SYSTEM FOR AUTOMATED DEVELOPMENT OF DOCUMENT OUTPUT PROGRAMS

[Abstract of article by Rybakov, A. V. and Borisova, Ye. A.]

[Text] A system developed for YeS computers and intended for automated obtaining of an output program for a document of any form on a visual display is described. Interactive and batch modes of operation are provided for. User may select program language to implement the program. Example of processing of a table using this system is given. Figures 4, references 13.

UDC 681.3.06./14

MESSAGE INPUT SYSTEM

[Abstract of article by Levenshteyn, L. M.]

[Text] An application program package called the "Message Input System" is discussed. Information on methods of message description and representation, means of system control, and the language that may be used in application programs for access to messages is given. References 2.

UDC 681.3.51./6.42

REALIZATION OF A DATA PROCESSING LANGUAGE BASED ON THE CODD RELATIONAL MODEL

[Abstract of article by Bezrukov, N. N. and Vernik, L. V.]

[Text] Experimental realization of the very high level language, RYaOD, is described. The language is designed for solving data processing problems and is similar to languages based on relational algebra. The operands in the RYaOD language are homogeneous arrays. An example of an RYaOD program is given. The RYaOD translator outputs the object program in PL/1 using the PL/1 preprocessing operators. Language operators are realized in the form of macrodefinitions and interpreting programs. A data converter is described which permits processing information selected from hierarchic data bases of the OKA SUBD [data base management system] in RYaOD programs. Figures 5, references 12.

UDC 62-52:681.3.06.2

OPTIMIZATION OF DESIGN OF DATA FILES IN AUTOMATED MANAGEMENT SYSTEMS

[Abstract of article by Bondarenko, V. S. and Postolaki, V. V.]

[Text] Several practical recommendations for optimizing data files with respect to memory levels are given. These procedures were developed and applied in designing, implementing and running the software of the automated management system "Morflot" [Maritime Fleet]. A methodological approach of "self-organization" of file systems based on operational statistics and use of special programs is proposed. References 6.

UDC 681.3.51./6.42

ORGANIZATION OF SOFTWARE-HARDWARE COMPLEX FOR AUTOMATING LOCAL EXPERIMENTS

[Abstract of article by Ursat'yev, A. A.]

[Text] The key requirements placed upon an airborne system for automation of local experiments and the problems of their software-hardware realization are discussed. Figures 3, references 6.

UDC 681.3.51./6.42

MEASUREMENT DATA PROCESSING COMPUTER COMPLEX

[Abstract of article by Baklashov, N. I.; Vasil'yev, V. N.; Solodikhin, G. M.; and Solodovnikov, V. A.]

[Text] A computing system, based on third generation computers, for automated processing of measurement information is discussed. Special attention is paid to problems of organization of the interaction of nonstandard information sources with computers, and to the structure of the system hardware. Modes of operation of the computing system and software composition are described. The complex is oriented to application within measurement-information systems and systems for automated processing of experimental data. Figures 3, references 10.

UDC 62-52:681.3.06.44

VIBRATION TEST AUTOMATED CONTROL SYSTEM FOR TERNARY VIBRATOR

[Abstract of article by Borisov, I. F.; Konchak, V. S.; Kuntsevich, V. M.; Mandrovskiy-Sokolov, B. Yu.; Poyda, V. N. (now deceased); Tunik, A. A.; and Chegolin, P. M.]

[Text] Modes of operation for a vibration test automated control system for a ternary vibrator using an M6000 computer are discussed. Results of system software tests are given. Figures 5, references 8.

UDC 681.3.51./6.42

PROGRAM PACKAGE FOR AUTOMATIC ANALYSIS OF ELECTROCARDIOGRAMS

[Abstract of article by Pervozvanskiy, A. A.; Kul'chitskiy, O. Yu.; Sloushch, A. V.; and Sokolov, Yu. V.]

[Text] Software for a system that automates one of the most popular and time-consuming physiological tests--the EKG examination--is discussed. The modular program package makes it possible to come to a conclusion of the "ill-healthy" type and the standard EKG conclusion. Algorithms and results of diagnostics of some EKG syndromes are given. Figures 3, references 5.

UDC 62-52:681.3.06.44

DETERMINING EFFICIENCY OF A SYSTEM THAT CONTROLS THE PRIMARY PETROLEUM REFINING PROCESS

[Abstract of article by Bakan, G. M.; Goryachev, V. M.; Nesenyuk, A. P.; and Tarnovskiy, Yu. P.]

[Text] A technique for determining the efficiency of an ASUTP subsystem that stabilizes qualitative indicators of products output by the primary petroleum refining process is suggested. This technique is a radically new approach to the problem of estimating efficiency under the conditions of inconstancy of the potential content of light petroleum products in raw material. References 3.

UDC 658.012.01.56:66.01

AUTOMATED DESIGN SYSTEM FOR BASIC CHEMISTRY PRODUCTION (SAPR-SODA)

[Abstract of article by Zaytsev, I. D.]

[Text] A mathematical model of an industrial automated design system is described as a dynamic system at each step of which occurs a technological graph that represents the design approximation of an abstract operator for projecting superpositions of base functions. Primary base functions of the SODA automated design system are worked out; they are intended for automation of design of a wide range of basic chemistry production. Figures 1, references 5.

UDC 62-52:681.3.06.44

AUTOMATED SYSTEM FOR CONTROL OF SUPPLY OF MATERIALS AND EQUIPMENT TO AGRICULTURE IN THE BELORUSSIAN SSR

[Abstract of article by Igol'nikov, L. Sh.; Kavalerchik, B. Ya.; and Pauk, V. G.]

[Text] Design and implementation of an automated system for control of agricultural material and equipment supply in the Belorussian SSR is described. A consolidated flow chart and a brief description of the primary problems are given. Figures 1, references 2.

UDC 62-52:681.3.06.2

AUTOMATED INFORMATION-MONITORING SYSTEM FOR MANAGEMENT OF SUPPLY OF MEDICINE

[Abstract of article by Kozyarskiy, D. Yu. and Mel'nikov, V. G.]

[Text] The system is designed to automate medicine accounting and distribution at a supply and sales organization. The capability provided for revision of any requisition input simplifies system implementation and ensures its high viability. The forms of the input and output documents are convenient for the user. The system operates on the YeS computer. It can be used at the level of pharmaceutical administration for a large city or oblast. Figures 2, references 4.

UDC 65-015.11:681.3.06.44

AUTOMATED ARRANGEMENT OF AIRCRAFT EQUIPMENT

[Abstract of article by Tikhomirov, V. A.]

[Text] The task of optimum arrangement of geometric objects in confined spaces is dealt with following the example of aircraft equipment packaging. Problem definition and results of one specific problem solution for a real aircraft are given. Figures 1, references 4.

UDC 658.52.001.63:681.3

OPTIMAL CONTROL OF PRESS SHOP PRODUCTION ORGANIZATION

[Abstract of article by Teterin, G. P. and Datsin, Ya. Ye.]

[Text] Methods are described for automated selection of optimal strategies of organization of stamping production based on a constructed descriptive stochastic model of the industrial process and the principle of maximum mathematical expectation of gain. Tables 1, references 6.

UDC 681.3.48./64

DEVICES FOR INTERFACE WITH THE OBJECT OF SM-1 AND SM-2 CONTROL COMPUTER COMPLEXES

[Abstract of article by Bredin, S. A.; Maslyuk, S. A.; and Sopochkin, L. A.]

[Text] Purpose, design principles and features of devices for interface with the object (USO) of SM-1 and SM-2 control computer complexes are discussed. The interfaces are a set of aggregate modules for collection, switching and conversion of monitoring signals and for issuing control signals at objects equipped with sensors, systems for local automation and actuating mechanisms of the State System of Instruments. The aggregate system facilitates an easy increase in the number of channels and types of functions which makes it possible to build subcomplexes of object interface devices, optimally consistent with requirements for a particular object. Figures 2, references 4.

UDC 681.3.14./21

'APD-MA - VIDEOTON-340 - ISKRA-2302' TERMINAL

[Abstract of article by Ivanov, P. M.; Gridyakin, I. I.; Tkhishev, N. A.; Kerefov, V. T.; and Teslya, P. G.]

[Text] Terminal equipment control unit in the data teleprocessing system for the "ASU-Goskomsel'khoztekhnika" implemented in the Kabardino-Balkarskaya ASSR is described. The unit interfaces the data transmission device APD-MA with an "Iskra-2302" and "Videoton-340." An algorithm for operation of the terminal is given. Figures 2, references 2.

[331-8545]

8545
CSO: 1863

PATTERN RECOGNITION ALGORITHM USED IN FORESTRY WORK

Riga NAUKA I TAKHNIKA in Russian No 1, 1980 pp 6-7

[Article by Karlis Zvirgzdin'sh: "Problems and Principles of Machine Vision"]

[Summary] The Sislava Scientific-Production Association in Riga has experimented with the use of a computer in forestry assessment work. Photographs of test sites are converted into coded images and fed into the computer. Given good quality photographs and a small number of objects (15-20), the computer can determine with sufficient precision the size of the tree trunks and the area of the test site.

Karlis Zvirgzdin'sh

[214-P]

CSO: 1863

COMPUTER USE INADEQUATE IN GEORGIAN SSR'S CONTROL FUNCTIONS

Tbilisi ZARYA VOSTOKA in Russian 4 Apr 80 p 2

[Article by Georgian SSR Academy of Sciences Academician I. Dzhordzhadze: "Modern Resources and Methods for Control of the National Economy"]

[Excerpt] Continuous growth in the complexity of control processes and the high requirements imposed on the labor of control have made vigorous introduction of large numbers of various types of control equipment necessary. On its own, however, the presence of a large quantity of technical resources would not solve the problem of raising the productivity of control. Moreover rather than the naturally expected reduction of organs and personnel employed in this sphere, the machinery of control continues to grow, which is raising doubt about the suitability of the technical resources employed.

This is happening mainly because technical resources are being utilized without a sufficient knowledge of the principles of their use and of their production potentials. We often find that an institution or an enterprise first acquires computers, and only after that does it begin to adapt them to long-existing, outdated forms of control. Given their obvious incompatibility, the highly valuable equipment either stands about idly, sometimes without being uncrated, or it is used at an impermissibly low intensity. The real influence the computer technology and entire ASU's [automatic control systems] being introduced have on the basic indicators of control functions in the country is insignificant, and the number of workers freed as a result of their introduction does not exceed 1.5 percent; the average daily load handled by the latest computers is low, and identical kinds of computers are dispersed among small organizations in the same region to solve the simplest problems.

Let us look at the Georgian SSR. There were 163 computers here in the middle of last year, belonging to 59 organizations and 30 computer centers. Consequently not only the computers but also small computer centers are dispersed. In this case 10 computers (6.1 percent) have not been put into operation, and 22 (13.5 percent) are not being used for various reasons.

How, meanwhile, are the operating computers being used? A mean daily load of from 4 to 8 hours was reported for 46 computers. In the first half of 1979 the total down time of the valuable equipment was about 21,700 hours. At the same time computers installed in organizations possessing new control equipment provide services to 5,300 persons, of which about 3,000--that is, more than half--have a higher education. This cannot be called a favorable situation.

How can we achieve the fullest productive impact from introducing modern computers and other technical resources into control processes?

Unity in the control processes and unity in the automated systems; their unification in high-capacity time-shared computer centers enjoying around-the-clock operation of all computers: This is the basis for dramatic growth in the effectiveness of control functions.

We should convert from separately operating, small computer centers to a unified republic automatic system to control the developed socialist economy of the Georgian SSR.

There are no ASU's at the workplaces and in the offices of the top managerial executives. There are computers and computer centers which do not work directly for them, servicing all personnel according to the principle of a separately functioning "reference bureau." Thus the man-machine system is failing in its principal attribute, where man plays the role as the deciding unit, as the generator of thoughts, orders, and the initial and final instructions. The second part of the system is a composite of two dissociated control mechanisms, one a traditional unit based on conventional control resources, and the other furnished with computers, computer centers, and ASU's, existing in parallel, but not included within the organic composition of the existing forms of control and at the workplaces of those responsible for management. This elicits a doubling in the growth of manpower and expense of the control machinery as a whole--that is, the impact we observe is opposite to that expected. Today more than 10 million persons are employed in this area in the country as a whole, and this is about 14 percent of all laborers and white-collar workers.

When ASU's are introduced into the offices and workplaces of the top executives, the system begins to function actively and directly as a self-ordering, self-learning system that provides immediate guidance and supervision of all control processes. Thus the automatic control system acquires its finished nature, transforming from two dissociated control complexes into one monolithic package that is unified both technically and organizationally.

The ASU frees top executives from nonproductive jobs and allows them to involve themselves in higher forms of mental labor required for the making of high quality, fully considered decisions.

The 24th CPSU Congress posed the task of creating a nationwide automatic system (OGAS) to control the national economy on a countrywide scale on

the basis of a state system of computer centers. We have been faced with a similar task for a long time as well--that of creating the "Gruziya" republic ASU. However, it has been found to be difficult to surmount the bureaucratic barriers. The force of habit and the inertia of thinking and action stand in the way. We must make a decisive break with the old techniques of "manual" control, and the old forms of organization that stand as an obstacle to introduction of the OGAS; boldly surmounting psychological barriers, we must neutralize bureaucratic tendencies and local interests.

The natural priority, the all-defining role of technology, the secondary nature of the means of its application, and the status of the forms of organization as only the third derivative make up the scientific basis of the need for revolutionary liquidation of the old forms of organization of labor, control labor in this case. But the long-obsolete forms of control organization have confirmed themselves so strongly in their traditional inviolability that attempts are made to adapt the latest control technology to these obsolete forms only as a means for acquiring knowledgeable information, without including this technology within the composition of control organs as part of a man-machine system capable of significantly updating and replacing the obsolete forms. Naturally nothing comes from any of this.

Highly productive managerial labor based on maximum use of computers brought together into high-capacity computer centers operating around the clock and utilizing all of their output capacities would result in adequate solution of all control tasks while sharply reducing the size of the control machinery in many ministries and organizations, since high-capacity computer centers are capable of servicing all other incidental organizations not possessing computers.

Here is a concrete example: Out of the 30 computer centers, operating mainly in Tbilisi (where 134 out of the 163 computers are located), we could create 13-15 computer centers in the first phase, after which the average daily computer load could be increased to 20-23 hours. Recall that many of the country's computer centers are working as much as 23 hours and 42-45 minutes a day, fighting to increase the working time by the minutes, and not the hours. There is another way as well. This would be to organically include the existing computers, computer centers, and ASU's into existing control systems having the privileges and responsibilities of a ministerial section or a main administration, with the goal of permitting them to perform their inherent function--efficiently providing the data required.

The lowest units in control--the collectors of the basic information--continue to be the weak point. We cannot find any of the simplest terminals and computer user stations at this level; nor need we mention that the main problem--creating a unified information network employing coded telecommunication--has not been solved.
[307-11004]

11004
CSO: 1863

TRAINING OF CYBERNETICS PERSONNEL

Tashkent EKONOMIKA I ZHIZN' in Russian No 11, 1979 p 72

/Article: "The Training of Cybernetics Personnel"/

/Text/ Today 118 automated control systems are in operation in practically all the sectors of the national economy of the republic, while the pool of modern computers, which are in use, numbers 328 units. The continuing process of creating and introducing automated control systems and the efficient use of computer hardware depend to a decisive extent on the availability and level of skills of the cybernetics personnel.

The republic interdepartmental council on problems of the improvement of management in the national economy examined at its regular meeting the question of the training of specialists in cybernetics.

It was noted that the graduating class of cybernetics personnel from educational institutions of the republic increased as compared with 1971 by nearly fivefold. This was accomplished as a result of the establishment of specialized schools at Tashkent Polytechnical Institute, Tashkent and Samarkand universities, the expansion of the cybernetics subdivisions at the Tashkent Institute of the National Economy, the equipment of them, as well as other higher educational institutions with computers, the organization of computer centers and halls, the appropriate laboratories and offices.

Cybernetics disciplines are now taught in all the technical and natural science departments of higher educational institutions so that the specialist of any specialization would have an opportunity in his practical activity to work under the conditions of an automated control system and to use computer equipment.

At the same time there are a number of substantial shortcomings in the training of cybernetics personnel in the republic. Only 70 percent of the need of the national economy for specialists in cybernetics with a higher education is being met. An even greater shortage is being felt for middle level personnel, for they are being trained by only two tekhnikums--the Tashkent Electromechanical Tekhnikum and the Margilan Economic Planning Tekhnikum--and in an inadequate number.

There is not enough room for computer centers and laboratories. Many educational institutions have not been furnished with the necessary number of small computers and electronic keyboard computers. A number of institutes (including the Tashkent Institute of Highways and the Samarkand Institute of Architecture and Construction) do not have computer centers, while the computer centers of Nukus University and Fergana Polytechnical Institute are training students on obsolete second generation computers. All the computer centers of higher educational institutions are experiencing a great need for peripheral equipment, special equipment and materials. The training of specialists in a number of necessary cybernetics specializations has not been organized.

The republic interdepartmental council suggested that the Uzbek SSR Ministry of Higher and Secondary Specialized Education jointly with the divisions of culture and education and the introduction of computer equipment of the republic State Planning Committee should provide in the annual plans for the enlargement of the body of students in cybernetics specializations with a higher and secondary specialized education, as well as the allocation of capital investments for the construction of a school of automated control systems of Tashkent Polytechnical Institute and a cybernetics tekhnikum in Tashkent.

The division of the introduction of computer equipment of the Uzbek SSR State Planning Committee and the republic Ministry of Communications have been commissioned to allocate to higher educational institutions and tekhnikums a greater number of modern computers, as well as teletypewriters, displays, keypunch machines, magnetic tape, special paper and similar materials, semimanufactures and equipment.

The Uzbek SSR Ministry of Higher and Secondary Specialized Education has been ordered to introduce beginning in 1980 instruction at higher educational institutions and tekhnikums in a number of new specialties in cybernetics and to continue the work on the organization of computer halls in the student dormitories of technical institutes.

[335-7807]

7807
CSO: 1863

AUTOMATED CONTROL SYSTEMS

Minsk PROMYSHLENNOST' BELORUSSII in Russian No 12, 1979 pp 19-20

[Article by B. Sobolev, laboratory director, TsNIITU [Central Scientific Research and Design-Technological Institute for the Organization and Technology of Control]: "The Automated Control System is Gathering Strength"]

[Excerpts] I shall begin with numbers. The savings resulting from the introduction of automated control systems in enterprises engaged in tractor and agricultural machine building during the last seven years has reached 19.5 million rubles. Decrease in production costs accounted for 65 percent of this savings while growth in production volume accounted for 35 percent. Outlays for setting up ASUP [automated production control systems] were recovered within an average of 1.8 years.

Automated control systems have been installed and are operating successfully in the leading Belorussian enterprises--the Minsk Tractor, Motor, and Gear Plants, the Gomel' Starter Motor Plant and the Gomsel'mash [Gomel' Agricultural Machinery Plant]. The information and computing centers set up at these enterprises have been equipped with hardware. Skilled specialists are maintaining them.

One of the promising trends in control automation at the tractor and agricultural machine building enterprises is the establishment of direct links and the making of optimal decisions with related automated control systems, particularly with ASU-sel'khoztekhniki [automated control system for agricultural equipment association]. Several dozens of months now go by before requests for agricultural equipment are entered in manufacturers' plans. This gap will be eliminated in the future.

I have discussed the possibilities of automated control systems and their development in the near future. I will now touch on some other problems. Automated control systems for enterprises and departments

are built through centralized facilities by NIR [scientific research work] and capital investments as a function of the expected savings. In the majority of cases, the savings amount has been established arbitrarily, since the scope of the work, composition of tasks and the technical and informational structure are not known in the planning stage. Centralized allocation of resources prevents an enterprise from investigating and comparing the effectiveness of building an automated production control system with other directions in assimilating new technology. Therefore, the savings has frequently been overstated. This has increased the amount of resources allocated to build a system as well as the size of the bonus in the case of successful implementation. The interests of the developing organizations and the customers have coincided. The amount of savings resulting from introduction of a system in this period have had no impact at all on the indicators planned for the enterprise. Thus, the enterprise obtained an automated production control system, which provides a certain savings (although possibly not that in the estimate) as a "gift" and was awarded a bonus for this. Deficiencies in the technique of estimating the annual savings have been reflecting the desired savings rather than that obtained. Plan tasks began to be made up based on these estimates. Thus, the Minpribor [Ministry of Instrument Building, Automation Equipment and Control Systems] plans for its organizations when setting up automated control systems an annual savings of not less than four rubles for each ruble spent and a pay-off period of not more than a year and a half. (Such high indicators do not exist in practice in a single area of technical progress). A change in the methods for planning and accounting for building these systems produced a drastic change in the attitude of the customers and developers toward estimating savings. Now the customers are forced to give up part of their resources as a function of the savings obtained and are more interested in lowering the estimates rather than overstating them. That is why when financing has to be arranged, a rather large savings is pledged by the enterprise, but in the stages close to introduction, when payment has to be made for the resources expended, various ways are used to put off the start of payments for the savings being obtained and to maximally lower the stated savings.

In this situation, one can suggest the following way out. After a customer decides to build an automated control system (or contracts with another organization for this), the technical and economic substantiation, which determines the efficiency of building the system, is worked out. The potential system developer is determined and the TZ [technical task] is given to him for coordination and revision. The developer adjusts the task and determines the outlays required using a prescribed efficiency factor (assigned by Gosplan directives for sectors, and by sectors for enterprises) and the amount of guaranteed annual savings.

In this case, the savings resulting from the introduction can not be less than that guaranteed. If the enterprise, in which the system is introduced, refuses to confirm the established savings, documents are drawn up by the superior organization in an indisputable procedure. After an experimental test, this procedure could be recommended for use in various sectors of industry.

And there is more. Analysis of the computer load shows that a large share of the time is spent on debugging and other work providing no direct return to management. In our view, this situation has resulted from the splintering of organizations developing the systems and the prevalence of narrow bureaucratic interests in the design solutions. It is hard to find a department which would not set up "its own" institute for creating automated control systems and "its own" IVTs [information and computing center]. Moreover, departmental institutes (KB, SKB, SKTB etc. [design, special design, special design and technological bureaus]) are setting up branches in other cities and regions of the country. As a result, just in Minsk there are dozens of such organizations and the majority of them are minor. First of all, they try to provide themselves with "their own" computers and IVTs on top of everything. There is no need to prove that a large IVTs with a group of computers can operate at a higher level. Even in a major ministry such as the Ministry of Tractor and Agricultural Machine Building, the possibility of setting up a single computing center for the tractor, motor and gear plants should be investigated. However, these enterprises are subordinate to different main administrations. It is evident that the Belorussian SSR Gosplan (if only for Minsk or the republic) has to draft proposals for setting up one or several inter-sectorial information and computing centers for collective use.

[336-8545]

8545
CSO: 1863

'SIRENA' SYSTEM TO BE REPLACED BY ASU-5

Moscow GRAZHDANSKAYA AVIATSIYA in Russian No 1, 1980 pp 20-21

/Article by Yu. Lovskiy, deputy chief, Glavagentstvo MGA /Main Airflight Information Agency, USSR Ministry of Civil Aviation/, and M. Levin, chief of the ASU-5 software division, GVTs GA /Main Computer Center for Civil Aviation/: "From 'Sirena' to the ASU-5"/

/Text/ Ticket sales and seat reservations for transit passengers have been made with the assistance of the "Sirena" automated system for about 8 years at the Ministry of Civil Aviation's Main Airflight Information Agency. During this time aviation workers in the capital and many other cities in the country have become accustomed to "Sirena" and cannot imagine working without it now. But this is not just a matter of habit. Air transport of passengers has increased so much lately that it is simply impossible to cope with the current volume of work without using computer equipment. It is sufficient to say that "Sirena" sold up to 60,000 and more seats daily during the summer period last year. And more than 40 million passengers in all have availed themselves of its services during its operation.

The system has been automating the assignment and return of seats and the sale of air tickets. However, many operations have remained unautomated. Thus the sale of a ticket through "Sirena" takes about 1.5 minutes; in the process, composing the request, the response of the system and the printing of a ticket take a few seconds. But before composing the request on a keyboard, the cashier must look at the schedule to determine the number of the flight, and after receiving the printed ticket he must note on it and the control stub the first and last name and patronymic of the passenger, indicate the number of his document, specify where registration for a given flight takes place--at the airport or the municipal air terminal, and apply the appropriate stamp.

Another example. The sale of seats reserved for certain institutions cannot be grouped with high-volume operations, since relatively few persons are concerned with this; for this reason, it is not covered by "Sirena." But the retention of two processing methods--automated and

manual--is fraught with errors, and particularly the possibility of "freezing" unoccupied seats. A number of unautomated or incompletely automated operations still exist.

In conformity with the coordination plan of the USSR State Committee for Science and Technology, an All-Union automated system for controlling the sale of tickets and seat reservations on domestic air routes (ASU-5) is being developed. It will consist of several centers located in different regions of the country. The Moscow center of this system will replace "Sirena" and provide for the dispatch of up to 20 million air travelers annually. In addition to an increase in the number of passengers served, a significant expansion of the center's operating functions, compared with the system now in operation, is envisaged. At the same time, ones which facilitate and improve aviation workers' working conditions also are being introduced. Together with the specialists engaged in development, the collective of the Glavagentstvo: dispatchers of the "Sirena" operations control center, cashiers, finance and planning workers--in short, all those who will have to operate the new equipment in the Moscow ASU-5 center--is taking an active part in this work.

What kind of changes will take place in the work of the Glavagentstvo and the Aeroflot agencies connected with it in the first stage of the Moscow center's introduction? First of all, the number of scheduled and unscheduled flights monitored by the system will be increased. In this connection, the necessity of selling tickets manually for certain additional flights before holidays, as is done now, will not arise. The system is designed for 24-hour operation, with an interval of just an hour, needed to organize sales on the next day. Because of this, service for passengers in cities east of Moscow, where interruption in "Sirena" operation now amounts to several hours because of the time zone difference, will be improved. The possibility of leaving in the system those flights whose departure is delayed for some reason and carried over for a day or two is envisaged.

To request a seat under the new system the passenger and cashier need not know the number of the flight for which a ticket is desired. It is sufficient to indicate the preferred departure time or the time of day (morning, evening) and the date, and the system itself will suggest one or several of the next flights for selection. The cashier at first can just explain which flight has an available seat and confirm it himself, and then enter in the system the data needed to make up the ticket: first and last name and patronymic of the passenger, the number of his document, the form of payment, and so forth.

It has been planned to fully automate the filling out of the ticket, including the data needed on the passenger, the form of payment, and payment documents. Under the combined form of payment the system determines the amount of the additional payment as cash and enters both sums

in the appropriate columns of the ticket. The ticket indicates the class in which the passenger is flying, his seat, and the time for beginning registration in the city air terminal and at the airport. In a word, everything is done so that the cashier is relieved of the need to make any manual notations whatsoever. These data, of course, must be composed and transmitted to the machine, but with the aid of a keyboard, like a typewriter. But such composition takes much less time.

A new ticket has been developed for the All-Union system which takes into account any form of payment, with or without passes. There are margins on it for the automatic entry of all the necessary notations. The ticket also has been designed for a flight with transfers.

The ASU-5 provides for automating the formulation of a cash record /kassovyy finansovyy otchet/. It will be put together not only for the ticket sales operations performed by the system, but also for other operations (additional fees, the return of sums for unused tickets, and baggage handling). For this the cashier should enter in the system the data on all his financial operations during work. At any time the cashier or an auditor will be able to reproduce on a screen the data on the current condition of the ticket office and receive a financial record in printed form at the end of a shift. When necessary, any operation performed during a shift, or answers to inquiries, such as which tickets were sold in a given time period, for a certain flight, and so forth, can be seen directly on the screen. This capability is made available not only for cashiers, but for workers in a number of other services. All operations connected with returning money to passengers for unused tickets will be simplified. The system itself will determine if a flight is delayed, and will calculate the sum subject to return, taking into account the time the flight was refused and the form of payment for the ticket. All these operations will then be reflected in the record.

As already stated, the sale of a reservation for institutions, although not a high-volume operation, requires better attention, careful control, and high management efficiency in the transferral of available seats for sale in some final stage. This work also will be fully automated. The system will begin to perform ticket sales based on the codes of the institutions entered in the request by the cashiers--the holders of a reservation, removing the reservation at an established time, and taking stock of and keeping a statistical record of seat use.

One of the characteristics of the Moscow terminal area is the transport of a large volume of mail by aircraft. Frequent changes in the mail maximums and their fluctuation according to the days of the week entail a need to increase or reduce the norms for ticket sales. The automated system provides for calculation of the number of seats presented for sale for each flight, taking into account the number of seats in the aircraft, the maximum commercial carrying capacity of the aircraft, the normative

average passenger weight in accordance with the seasons, and the average volume of baggage and the mail maximum. Practical and accurate calculation of the norms for ticket sales for each flight will make it possible to load the aircraft more efficiently.

Of course, this is possible only under the condition that the maximum commercial carrying capacity reported to the Glavagentstvo is close to the actual capacity. And here it is appropriate to mention one urgent matter. We often encounter underestimation of these figures by the Moscow airports. This prompts passengers to come to airports with the intention of departing on a ticket provided earlier than the time specified on it. As a result, unnecessary commotion and irritability develop, but aircraft nevertheless often depart underloaded.

Similar situations also exist in cases when aircraft with different numbers of seats are operated on the same air routes and their actual number--often greater--becomes known only immediately before departure. Automation of the calculation and correction of the norms of ticket sales will make it possible to more fully utilize opportunities for departure. But for this, correct and timely data on aircraft passenger capacity and flights on aircraft of the same cabin configuration will be necessary.

Unfortunately, for various reasons the "Sirena" system has not succeeded in organizing the collection and analysis of diverse commercial statistics well enough. The ASU-5 being developed will accumulate extensive statistics characterizing in accordance with more than 20 indicators the sale of seats, the dynamics of passenger demand, the activities of subunits of the Glavagentstvo and the agencies of other cities which are subscribers of the Moscow center, as well as on the work of the system itself. In particular, data will be put together on the dynamics of the demand for each flight, which then will enter the TsNII ASU GA /Central Scientific Research Institute for Automatic Control Systems in Civil Aviation/ for use in automated systems in formulating plans and schedules for aircraft flights.

The Moscow center is being planned as one of the principal bases for the unified All-Union ASU-5. In the first stage it will also include the Riga center being built. Then other peripheral centers, which can be subdivided into large ones designed to serve up to 6 million passengers annually, medium-sized ones to serve up to 3 million, and small ones to serve up to 1.5 million passengers, also will be introduced. It is being proposed to equip them with electronic computers of one class of the SM-2 type. Depending on the number of departures, they will have up to four such computers. The Moscow center, as the largest, will be established on the basis of a complex of seven computers.

For the Moscow and large- and medium-sized centers a specialized operational system is being developed, oriented to the tasks of high-volume service--such as management of ticket sales and seat reservations. It will make it possible to improve overall productivity and reliability of the complex, to reduce the time for serving passengers, and to ensure exacting preservation and confidence in the data stored in the system.

With the objective of improving management, a system of automated card files is being developed. Each card file has been specialized. It consists of cards for a specific function. For example, the "card file of flights" will consist of flight cards. In having this automated system available, personnel of the agency will practically perform such operations as making new cards, correcting or discarding old cards, retrieving and reading cards which respond to given conditions, calculating statistical indicators, and the like.

In the process of developing the system it is necessary to resolve a number of problems of a scientific research nature. Thus, to check out the programming software and perform test operations, a test (adjustment) complex has been established in Moscow. In preparing to put the system in operation and immediately after its introduction, it will be required to carry out a number of measurements of its performance, which will be the basis for developing a model plan for ASU-5 centers.

Determination of the number of centers has been specified for the 11th Five-Year Plan. In the process of this determination, an increase in the functions performed by centers also will take place. In particular, as a result of the consolidation of centers, the sale of a ticket to a passenger traveling with transfers will prove to be possible by means of automatic seat reservation.

Introduction of the centers of the All-Union ASU-5 system will contribute to a new upswing in the standard of service for passengers in our air transport.

[66-8936]

8936
CSO: 1829

CONFERENCE ON AUTOMATION OF PLANNING AND DESIGN

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 2, 1980 signed to press 21 Mar 80 p 140

[Article by K. D. Zhuk and A. A. Nikiforov in the section "Symposiums, Conferences and Meetings"]

[Excerpt] The All-Union Conference, "Automation of Planning and Design," was held in Moscow from 23 through 25 October 1979; it was organized by the USSR Ministry of Higher and Secondary Specialized Education (MVSSO), the Coordinating Council of the USSR MVSSO on the problem of SAPR [automated design systems], and the Moscow Order of Lenin Aviation Institute imeni S. Ordzhonikidze. About 1000 scientists, engineers and technicians from various USSR organizations took part in the conference. The conference program included 333 papers and reports selected by the organization committee; the theses of them were published by the start of the conference.

[330-8545]

8545
CSO: 1863

AN AUTOMATED SYSTEM FOR TECHNICAL DESIGN CREATED BY ABRAITIS AND SEINAUSKAS

Vilnius LITERATURA IR MENAS in Lithuanian No 44, 1979 pp 4-5

[Interview with professor Liudvikas Abraitis, doctor of technical sciences, of the A. Snieckus Kaunas Polytechnical Institute, Chair of Mathematical Instrumentation, by journalist Algimantas Liekis: "At the Borders of the Future"]

Liudvikas Abraitis

[Excerpts] Before beginning the conversation, I would like to remind the reader, who does not always have time to follow our scientific news, that during recent years substantial achievements have been made in Lithuania in the field called "computer science." An automated electronic equipment system for technical design has been created. Professor L. Abraitis and his colleague lecturer Rimantas Seinauskas were awarded the republic's 1979 prize for it. From the economic point, the efficiency of this system is difficult to even evaluate. Until now it has taken several years for hundreds of specialists to design each new electronic computer, who nevertheless, could not avoid making technical errors. Now, for the first time in our country, the electronic computer itself is beginning to perform this work. In V. Lenin Electronic Computer Plant of Vilnius, using the system devised by the workers of Kaunas, almost 5,000 components are already being designed automatically for new electronic computers being created. Thus, a machine is already devising another machine. In fact, our third-generatinn electronic computer is already designing the components for a fourth-generation electronic computer.... This is vitally important now that automated control systems are being introduced in a large-scale in our national economy -- it is the basis of technical progress. The slowish pace of construction and production of new electronic computers quite often impeded this important work.

[Question] Professor, the collective headed by you was assigned to coordinate the work carried out in the whole country concerning construction and utilization of the automated systems for technical design. It is a high recognition of Lithuanian scientists. And our interest in these problems is fairly recent. You yourself were the initiator.

[Answer] When in 1962 I started to prepare my candidate's dissertation on design automation, I was helped greatly by Moscow professor Yaroslav Khetagurov, who was my advisor. We were heartedly supported by the scientists and chiefs of Kaunas Polytechnical Institute, particularly by the assistant dean R. Chomskis. Now we have a group of talented scientists working in this field.

[Question] I am curious why the term "computer science" is used.

[Answer] It is not only a term but a really new branch of science, diverging from other traditional sciences, even those as closely related as radioelectronics, electrotechnology, and cybernetics. Computer science has its own research methods, its own concepts, particularly in forming algorithms, preparing programs, solving mathematical provision and other problems.

[Question] The purpose of our conversation is to get at least somewhat acquainted with yours and your colleagues' daily routine, with the atmosphere which is vital to your activities, your research.

[Answer] I am pleased to hear of this interest in us. I would like for it not to be occasional but permanent. Because lack of it, lack of information tells ... even in our literature. What do I sometimes miss in today's literature? Today, many heroes are the same as they were 100 years ago. Except that they drink and smoke more, dance to the music of electronic instruments. Granting that it is being written about an engineer of a physicist, but even then you cannot see what really sustains them. And yet, the largest part of their life is spent solving specific problems, not sitting in restaurants or loafing aimlessly. At work are experienced the greatest joys and sorrows; here the character becomes most defined. One often hears the statements of the representatives of the humanities: "I am not interested in who is doing what...I am only interested in the man himself." It is naive. As if that "man" floated in a vacuum and his life did not depend on the conditions created by the achievements of science and technology.

[Question] And how would you yourself describe the activities of a representative of your field, i.e. computer science -- the research, difficulties, the entire scientific creativity process?

[Answer] A difficult task. Well, but let us try. We are accustomed to call creativity such human endeavors which bring something qualitatively new, something that never existed before ... Let us look from this point of view at the work of a programmer. A highly qualified programmer algorithmist equals a poet, has stated American scientist F. Brooks. Really, a programmer must find the only path out of possibly hundreds and to describe it in the language understood by a machine. Most frequently such a path is searched for by heuristic methods.

[Question] Here again the readers should be reminded that heuristics did not receive (by us too) an immediate acceptance. Many, particularly the elderly mathematicians, declared themselves for the formal mathematical methods, where it is strived to calculate all possible alternatives.

[Answer] Nevertheless, practice has shown that in creating programs for systems of automated technical design, heuristic methods are used more. And not so many errors occur. A man can often feel intuitively the solution of this or that problem, the possible circuit of an electronic assembly, etc. The scientists, racking their brain how to "teach" a machine to be capable to design another machine first try to imagine how man himself would behave in such a case. In other words, fantasies, intuitions, present the idea born of knowledge to logical thought analysis. It means that a scientist, designer, while creating new machines, first works as an artist and after that as a theoretician. By the way, such geniuses as Mendeleev, Poincare, Einstein, Bohr, and many other have written frequently about this. Imagination, fantasy, and intuition are like ideass wings, helping man rise above the familiar everyday routine, to see more. But ideas also need emotions. Without them, the idea is dead. It does not entice forward. When emotions and enthusiasm are gone,

the creative initiative degenerates also. Precisely are, literature, and philosophy help a scientist, designer to maintain it all on a "necessary level." When a representative of exact sciences attends art exhibits or tries himself to compose music, write poetry, please believe, most often it is not a hobby but a necessaty to a man wanting to work successfully, to be creative in his basic sphere. When solving a problem in a narrow field, he must concentrate all his intellectual and emotional experience. "If I have achieved something in life," Newton has said, "it was only because I stood on the shoulders of giants who lived before me."

[Question] And what place in your work do you give mathematics? You give priority to heuristics, methods which are truly close to artistic creativity. Meantime, it is said that every science is a science only in so far as mathematics can be applied to it.

[Answer] We are not against mathematics. Never! But at the same time we do not consider it the basis for everything, capable of providing optimal answers. I do not wish to insult anyone by this. However, we use mathematics or the formal methods less frequently than heuristics. Just like an individual or a collective must sometimes change the methods of action when seeking a projected goal, so too in case of failure in a complex automated system the algorithms must be changed (failing, for instance, to determine by heuristic algorithms the optimal methods for arranging transistors in the elements of an electronic device, we use different type algorithm.) Exactly here manifests itself the difference between man's conscious actions and a machine. As a matter of fact, all the previous polemics in print concerning "machine or man", could be continued today worded "heuristics or formal methods?" By using heuristic methods we have not only already "taught" machines to design other machines but we can "teach" them to play chess, write poetry, and compose music. The application of heuristics has shown the truly inexhaustable possibilities of the human brain and also that it will be difficult for a machine to replace him. It will only help him more each time, will free him from menial labor -- from time consuming calculation, information collection and processing, chart preparation. Why, a scientist now can devote to purely creative work no more than 5% of his time. A machine will provide all the opportunity for man's creative genius to manifest itself fully.

[Question] One of the most typical characteristics of creativity is comparison, analogy...

[Answer] We too cannot do without it. For visualization's sake we form models, draw charts, to perceive more -- let us use the word "plastically" the complicated phenomenon. In the automated system for technical design devised by us, a man can follow all the time the variations of design solutions offered by the electronic computer and to adjust them at his descretion...

[Question] Since we have already mentioned literary terms, perhaps you would tell us how useful are to you parodoxes?

[Answer] Very useful. In art paradox is used to bring together contradictions and thanks to their clash, recognize the truth quicker. We use it widely in evaluating programs prepared by heuristic or other methods for electronic computers, the proposed theories, etc. Dependence on authority, a rigid opinion promises nothing good for a scientist. Where there are no arguments, no "personal" opinions, there is no creativity. Are any more examples needed which would further attest that our, scientists, basic working "instruments" are essentially the same as those of the artists? They have been and are being used by the representatives of many exact sciences, technical fields, who perhaps only do not think about it seriously.

[Question] The logical conclusion is: the future again will have to belong to the universal men of broad erudition and not to narrow specialists. But it it realistic? Today in the world are working 93% of all the scientists who have existed during the entire history of mankind. Almost every year we hear of new branches of science and technology. Up until now the most specialized route was taken and was encouraged to be taken.

[Answer] The advancement of science and technology demands ever more clearly, whether we like it or not, to extend and broaden our erudition. This is particularly important to a man working in our field. He must be well informed in mathematics, technology, electronics, and many other subjects. Furthermore, as I mentioned before, he must be sensitive to humanitarian values. Only then can be become a creative personality. And a creative, erudite man finds quickly heuristic solutions. Naturally, speaking about man's universality, about a versatilely developed personality, it would be naive to demand that each be equally well versed in several fields. Let us say, one could work until lunch as a surgeon and after lunch could go to a nuclear physics laboratory. A dilettante -- is worse than a narrow specialist who creates nonetheless at least something worthwhile. However, every cultured man should be able to know where the boundaries of knowledge and ignorance begin and end.
[170-7147]

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COMMEMORATION OF FIFTIETH BIRTHDAY OF V. S. MIKHALEVICH

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 2, 1980 signed to press 21 Mar 80 p 110

[Text] Vladimir Sergeyevich Mikhalevich, the well known Soviet expert in mathematical and economic cybernetics, deputy director of the Institute of Cybernetics and academician of the Academy of Sciences of the Ukrainian SSR, celebrated his fiftieth birthday on 10 March 1980.

V. S. Mikhalevich has made a great contribution to solving a number of problems associated with efficient use of mathematical methods and computers in economic research, planning, design and control. He formulated the principles for constructing methods of sequential analysis of alternatives--the most efficient procedures for solving practical problems, based on making essential use of the specific properties of the processes and phenomena being studied, which made it possible to generalize the ideas of the theory of statistical solutions and methods of dynamic programming. As the scientific director of work on developing the automated system for plan accounts of the Gosplan of the Ukrainian SSR and a number of sector automated systems, V. S. Mikhalevich is devoting a great deal of attention to the problems of optimal control of complex systems and is actively taking part in developing the RAS [republic automated system] and the OGAS [statewide automated system].

The editorial board of the journal UPRAVLYAYUSHCHIYE SISTEMY I MASHINY sincerely congratulates Vladimir Sergeyevich on his jubilee and the presentation to him of the high governmental award--the Order of the October Revolution--and wishes him good health and new creative successes for the welfare of our great homeland!

The Editorial Board

[330-8545]

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CONTROL SYSTEMS AND MACHINES

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 1, Jan-Feb 80 pp 3-5, 6, 7, 8, 14-15, 16, 21, 24-27, 33, 36, 37, 41, 45, 46, 49, 55, 56, 60, 61, 64-65, 69, 70, 72, 76, 80, 90, 93, 103, 105, 106, 110, 112, 116, 117, 121, 122, 140, 143, 144, 145, 149, 151

[Editorial report, article, excerpts from articles, notices to readers, list of authors and abstracts]

[Text] PROGRAMMING TECHNOLOGY: INFORMATION REPORT ON THE FIRST ALL-UNION CONFERENCE [Program Committee -- pp 3-5]

The USSR State Committee for Science and Technology, the USSR Academy of Sciences, the Ukrainian SSR Academy of Sciences, the State Committee for Science and Technology's Scientific Council for Computer Technology and Control Systems, and the Presidium of the USSR Academy of Sciences conducted the First All-Union Conference on Programming Technology on 4-8 June 1979 in Kiev.

The purpose of the conference was to generalize existing programming methods and develop recommendations for the industrial development of programmed systems. The conference's timeliness was determined by the urgent necessity of raising the general level of programming in this country and creating Soviet programming technology for the production of large programmed systems.

The conference featured an impressive forum of specialists: more than 500 representatives of 345 organizations from 108 cities throughout the country participated in it, and this figure increased to more than 1,000 people when the workers from scientific institutions and organizations in Kiev were counted.

The conference gave particular attention to the fact that in the technology for the development of large programmed systems and individual programs, it is necessary to include the entire

complex of methods and automated facilities used in designing, development work, documentation, controlling the work of programmers and supporting (maintaining the workability of) programs. The term "programming technology" includes the analysis and structurization of problems and assignments and methods for the automated designing of programs. The important distinguishing feature of programming technology is an examination of the entire "life cycle" of programs, beginning with the formulation of the requirements for the specifications and ending with the problems involved in producing, supplying and maintaining the programmed equipment.

The technology for the development and maintenance of software that is taking shape is oriented on overcoming existing difficulties in the work of programmers, with special emphasis on searching for and realizing potential reserves for increasing the productivity of the programmers' labor and improving the quality of the programs, so a special role is played by mass industrial development and utilization of standardized, instrumental packages of applied programs.

The conference took note of positive experiences in the development and utilization of technological programming complexes, among which such systems as RTK, PRIZ, APROP [automated system for program production], YaUZA and ASPP [automated systems for applied programs] SINTYeRM are notable for their high level of solution of theoretical and applied problems. These systems have a number of important uses, but their introduction into operational practice in numerous organizations throughout the country that are engaged in programming is still proceeding unsatisfactorily.

In order to master more fully the modern technology for program development and adjustment in all organizations using computers, it is necessary to introduce modern methods for organizing the labor of collectives of programmers, create facilities for automated program development technology, and supply developers with dialog equipment, graph plotters and so on.

In a decision adopted at the final plenary session on 8 June 1979, the conference's participants requested the USSR State Committee for Science and Technology to review the technological programming complexes named above for the purpose of recommending them for extensive use, as well as to introduce into existing normative documents (and those being developed) for regulating the creation of systems with the help of computers, additional requirements on the inclusion in the specifications of points obligating the developers to use and indicate clearly programming technology that increases the productivity of the programmers' labor.

Those at the conference recognized the necessity of accelerating the development and approval of normative documents defining the activities of organizations belonging to the State Fund of Algorithms and Programs (GosFAP), organizations that develop programming facilities, and user organizations participating in the development, acceptance, supplying, introduction and maintenance of programs. In the opinion of the conference's participants, the State Committee for Science and Technology must also organize a project for the creation of an All-Union classifier of programming facilities and develop an order for economic stimulation of the transfer of programming facilities into GosFAP and the implementation of author supervision, while USSR Goskomtsen [expansion unknown] should develop and approve unified prices for programming facilities and rates for services performed for users by organizations that are part of the GosFAP system.

The conference thinks that during the development of plans for 1980-1985, the USSR and Union republic Academies of Sciences, the USSR and Union republic Ministries of Higher and Secondary Special Education, and other ministries and departments must provide for the conduct of basic research and scientific research and experimental design work in the field of programming technology, as well as the creation of packages of applied programs, study plans and automated study course programs, and teaching systems for the training of specialists in programming technology.

In order to shorten the period for preparation of the programs and reduce their cost, in addition to improving their quality and reliability, it is advisable to insure the primary allocation of modern computer technology to the institutes and organizations that are doing work in the field of programming technology and systems and applied software in accordance with the programs of projects for the most important scientific and technical problems, as defined by the USSR State Committee for Science and Technology.

The conference made the following recommendations for ministries and departments:
in the specifications for systems using computers and systems of computer and computer center software, to introduce an obligatory requirement on the use and clear indication of the programming technology that is used to increase the programmers' productivity;
to provide organizations that are developing automatic control systems and other systems utilizing computers with technological programming complexes and applied program packages that are available from GosFAP;

select the main organization in a ministry or department that, on a commercial basis, must engage in the production of programmed facilities, the creation of new and the introduction of existing technological program production lines, and the training of programmers in other organizations of the ministry or in organizations belonging to other ministries to work with them; in organizations developing programming facilities for computers, to create structural subunits with the assignment of introducing, adapting and supporting standardized programming technologies.

The conference requested that the ministries producing series computers create specialized enterprises and organizations for the production of software facilities based on modern programming technology, as well as the centralized production, supplying and maintenance for the user of the software for these computers.

The conference requested that the USSR State Committee for Standards accelerate the development of standards and other technical normative documentation on the order of the technical preparation of program production and the development of the support and operation of programmed products as an industrial article.

In its decision, the conference noted the high degree of effectiveness of the new "booth" form in which it was conducted, which enabled all of its participants to acquaint themselves thoroughly with a large amount of information (more than 250 reports) in a short period of time.

IMPROVING PROGRAMMING TECHNOLOGY -- A MOST IMPORTANT NATIONAL ECONOMIC GOAL [V.A. Myasnikov; excerpts -- pp 6, 7, 8]

At the end of 1979, more than 4,000 ASU's [automated control system] for various purposes and more than 3,500 computer centers were in operation in this country. There was an increase in the number of computers of different classes (mini- and microcomputers, in particular) being produced. The industry is preparing itself for the production of standard control, arithmetic, communication and other processors from a set of adjustable units that are used both in the central computer and at the terminal points, which will make it possible to create developed, distributed, terminal-type computer networks that can subsequently be integrated into the State Network of Computer Centers. Disparallelization and specialization in the performance of various functions will be widely used in computer systems: some processors will perform the functions of controlling masses, sorting and s[illegible] while others will carry out the parallel solution of specific applied problems.

While mentioning the rapid development of Soviet computer technology, at the same time we cannot help but see serious flaws in its creation and utilization. First of all, we must mention the as yet low technical indicators of several types of computers and the fact that the provision of peripheral gear for them is unsatisfactory. The production inventory and volume of production of such peripheral gear do not make it possible to set up computer centers and ASU's in accordance with the planning documentation for them. The situation with the production of medium- and large-capacity memory units on replaceable magnetic disks and flexible magnetic disks remains particularly unsatisfactory. The production and technical level of such peripheral gear as user terminals, data transmission multiplexers and displays are lagging behind. As far as the maintenance and repair of computers -- the work loads of which are substantially below the established norms -- are concerned, the shortcomings are still rather large.

The R-technology for programming and means of automating in on the basic Soviet computers (BESM-6, YeS EVM [Unified System of Electronic Computers] and SM EVM [International System of Small Computers]) has been created, for which great praise is due the Ukrainian SSR Academy of Sciences' Institute of Cybernetics and its director, Academician V.M. Glushkov. The creation of software for generating packages of applied programs (the PRIZ system of the Estonian SSR Academy of Sciences' Institute of Cybernetics and the Scientific Research Institute of the Tallin Electrotechnical Plant imeni M.I. Kalinin) has been completed.

There exists a gap between the development of programmed facilities and the organization of their delivery and maintenance. Work on standardization in the field of programming is being done very slowly, and the content and performance of scientific research in the area of systems and applied programming lags behind the level of the rest of the world and does not meet our practical requirements.

At the present time, the centralized control of the creation of such extremely important components of computer software and control systems as operating systems, systems for programming in high-level languages, and packages of general-purpose programs is carried out primarily in accordance with the scientific and technical programs for working on problems of the USSR State Committee for Science and Technology.

The system of GOST's [All-Union State Standard] for programming languages and for rules for formulating and compiling programming documentation (the YeSPD GOST's) that are also being developed in this country are having a positive effect on the entire pattern of program development and quality.

The USSR State Committee for Science and Technology considers the main scientific problems in the field of software to be the following:
in the area of insuring remote access and the creation of computer networks -- research and development of software systems that make it possible to organize joint work with a central computer on the part of 150-300 remote terminals; the development of systems that provide a dialog mode in the users' languages that is maximally close to a natural language, as well as "interfacing" with data bank control systems; automation of planning and automation of scientific research; development of software equipment that makes it possible to control data transmission and processing networks;
in the area of organizing training -- research and development of methods and equipment for automating the process of training users to work with large programmed complexes and for accelerating this process;
in the area of providing parallel computations -- research into methods for disparallelization of algorithms for solving large problems, which would make it possible to increase the effective operating speed of computers substantially;
in the area of creating microprocessor systems -- research and development of software systems for microprocessors and computer systems that use microprocessors as modules, as well as the development of special languages for communicating with microcomputers;

UDC 681.3.06./94

STATE OF THE ART AND PROBLEMS IN THE PRODUCTION OF SOFTWARE FOR INFORMATION CONTROL AND PROCESSING SYSTEMS [V.V. Lipayev; excerpt -- pp 14-15]

At the present time we have developed and are using a number of technological systems for automating the planning of programs for different purposes, such as (for example) SINTYeRM, AL'FA-6, APROP [automated system for program production], PRIZ and others. The differences between the systems are determined both by the specific nature of the problems formulated during their development and the special features of their creators' collectives.

In order to automate the designing of large complexes of information and control programs, a large cross-system for the automation of programming and debugging (SAPO) that was named YaUZA-6 was created under this author's supervision and used successfully in 1976 [5]. This system is oriented on the designing of complexes of control programs for computers with arbitrary command systems, for which purpose YaUZA-6 can be

relatively easily and automatically adapted to the command systems of such computers. Three interrelated languages on different levels are used for programming: AVTOKOD [Autocode], MAKROYaZYK [Macrolanguage] and the algorithmic language YaUZA. During the creation of the system, special attention was given to the production of programs of high quality as far as using a computer's memory and productivity were concerned, as well as to means for integrating large complexes of programs. YaUZA-6 contains facilities for monitoring and testing programs and means for producing various documentation. Information on the complex of programs is collected, stored and corrected in a specially structured design-data base. Simultaneous user operation in the package and dialog modes, from several terminals, is provided for.

The YaUZA-6 SAPO operates with a BESM-6 high-speed computer and at the present time consists of 23 subsystems with a total capacity of about 400,000 commands. The computer-oriented part consists of about 12,000 commands and 16,000 table cells, most of which can be prepared automatically. The system is being operated in 11 organizations and has been adjusted to the command systems of more than 20 types of control computers. A total of 31 enterprise standards have been developed for users, in connection with which the total volume of the documentation exceeds 1,000 pages. The labor-intensiveness of the creation of the YaUZA system was about 300 man-years.

The TYeMP technological system for automating the designing of programs and microprograms for microprocessors and microcomputers has been developed on the basis of the YaUZA-6's subsystems [6]. This system makes it possible to translate programs written in ASSYeMBLYeR microcommands, command-level ASSYeMBLYeR and MAKROYaZYK. For debugging, interpretation on the command and microcommand levels is provided. In addition to documentation, the system makes it possible to prepare programs on machine carriers from which the data are entered in a microcomputer. User interaction with the TYeMP system is possible in the package and dialog modes.

UDC 681.3.51./6.42

THE SINTYERM AUTOMATED PROGRAM PRODUCTION SYSTEM [Ya.Ye. Ayzenberg, I.V. Vel'bitskiy, B.M. Konorev, A.A. Stogniy; excerpts -- pp 16, 21]

The SINTYeRM automated program production system (ASPP) is intended for the production of software for specialized computers (SVM) on a general-purpose technological machine. An SVM is understood to mean a computer in which there are no programming

automation facilities for producing its own programs: they are either microprocessors or newly created computers or computers (processor, controller and so forth) that operate in a control circuit and do not contain input-output units for communicating with the developers of the appropriate SVM software. As a rule, there are especially stringent requirements for debugging quality for the software of such computers relative to their operation in real time and interaction with numerous units of the controlled system.

The SINTYeRM ASPP is a set of software and hardware for the regulation of techniques, technological methods and patterns that insures the automated performance of all types of work involved in the production of SVM software.

In this article we present a conceptual description of the SINTYeRM ASPP that is a theoretical generalization of the three different program production systems that have been in industrial use since 1973. All of the systems are based on the BESM-6 high-speed technological computer.

The SINTYeRM ASPP is set up on external BESM-6 carriers and occupies 160 zones or about 300,000 BESM-6 commands. The system's basic units have the following capacities: the STELZy unit -- 60,000 commands; the translator from FORTRAN -- 20,000; the translator from SVM AVTOKOD [Autocode] -- 14,000; the technical documentation production subsystem -- 34,000. For effective operation of the ASPP, a BESM-6 computer in standard configuration is required.

UDC 681.3.51./6.42

ANALYSIS AND GENERALIZATION OF EXPERIENCE IN MAINTAINING THE SINTYERM AUTOMATED PROGRAM PRODUCTION SYSTEM [V.F. Kirsanov, A.B. Romanovskiy, V.M. Yurchenko; excerpt -- p 21]

Software maintenance is also understood to mean modification of the software as it is being used. Software maintenance is a necessary and laborious process: at the present time, expenditures for maintenance are 70 percent of the total software expenses [1]. In this article we analyze the experience amassed in maintaining the software of the SINTYeRM automated program production system (ASPP) and determine the factors that reduce maintenance expenses.

The SINTYeRM ASPP is a large hardware and software complex that is used to develop software for specialized control computers [2-4]. The basic programmed part of the ASPP -- the programming automation subsystem -- was developed at the Ukrainian SSR

Academy of Sciences' Institute of Cybernetics in 1971-1973 and has been in industrial use since 1973. The subsystem's capacity is about 200,000 BESM-6 high-speed computer commands. The maintenance group consists of three systems programmers and is part of the todel [translation unknown] developer. In the rest of this article we will discuss the maintenance of the SINTYeRM ASPP's programming automation subsystem, which for the sake of brevity we will simply call "the system."

UDC 681.3.06./94

A SYSTEM FOR AUTOMATING THE PRODUCTION OF SOFTWARE FOR A CONTROL MULTIPROCESSOR COMPUTER COMPLEX [I.M. Stepanov, Yu.L. Usov, V.A. Maslov, V.M. Shchelokov, V.B. Kopylov, Ye.S. Lunkin; article -- pp 24-27]

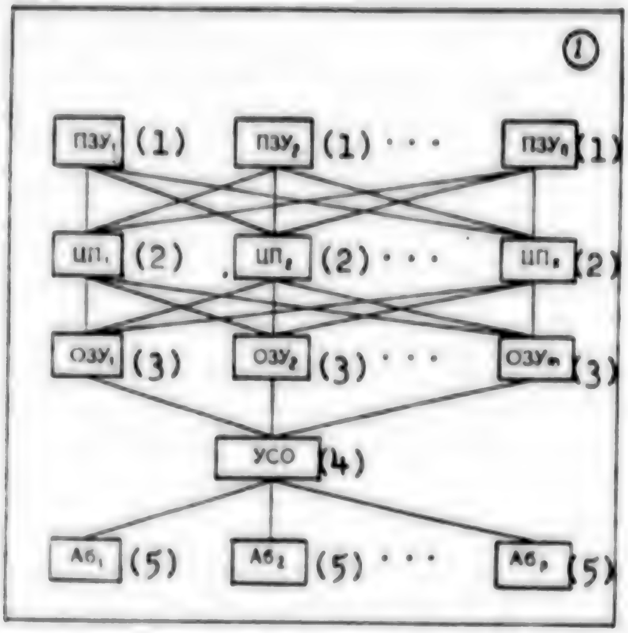

Figure 1. Structure of a control multiprocessor computer complex.
Key:
1. Permanent memory
2. Central processor
3. Main memory
4. Coupling unit
5. Subscriber

Introduction. Existing systems for automating the production of software [1,2], which are also called technological software systems, are used for a broad class of computer complex problems and structures. Nevertheless, some of the special features of the structures and organization of the computational processes of newly developed computer complexes have compelled us to resort to the development of new technological software. In connection with this it is necessary to make maximum use of

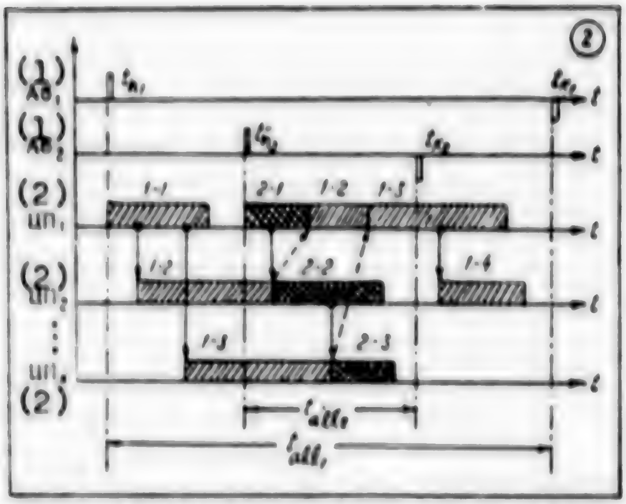

Figure 2. Organization of the computation process in a control multiprocessor computer complex.
Key:
1. Subscriber 2. Central processor

standardized systems by adjusting them to the structure of the computer complex.

The control multiprocessor computer complex (UMVK) under discussion has a modular structure (Figure 1) and consists of k uniform central processors (TsP), n permanent memory (PZU) modules where the programs' commands and constants are stored, and m main memory (OZU) modules. Requests from p subscribers (Ab) enter the system through a coupling unit (USO). The TsP's are connected to the OZU and PZU modules according to the principle of "each with each."

The computation process is organized as follows (Figure 2). A request for service from the i-th subscriber arrives at moment t_{n_i} and the processing must be completed by moment t_{k_i}; that is, the allowable processing time is $T_{all} = t_{k_i} - t_{n_i}$. The rigid temporal restrictions required that parallel and simultaneous processing of independent branches of the programs in k processors be introduced, along with subscriber servicing discipline with absolute priorities and preservicing.

The special features of the structure and organization of the UMVK's computation necessary made it necessary to introduce additional constructions into the language facilities of the programming automation and program debugging system and to supplement the structure of the technological software with a system for designing computation processes and a system for dynamic debugging of the programs and the computation process.

The Programming Automation and Program Debugging System. The programming automation system includes two languages: FORTRAN-C and AVTOKOD-C [Autocode-C]. As a rule, the development of working software for a UMVK takes place in two stages. In the first stage the control algorithms are chosen and programs in high-level languages (of which the one most widely used at the present time is FORTRAN) are developed for the purpose of evaluating and debugging them. Then, after the algorithms are debugged, they are reprogrammed in AVTOKOD's for the purpose of obtaining highly efficient working programs. FORTRAN-C, which has been expanded by language constructions that approximate it to the AVTOKOD's, was developed in order to achieve a maximum shortening of the second stage.

The following have been introduced into the standard for FORTRAN-C:
a new type of data with a fixed point and scale;
a new type of data for processing the individual bit positions of a machine word;
operators for inserting separate sections of a program in AVTOKOD;
operators for organizing parallel computations.

Besides this, exchange operators received further development and recoding operators and real-time exchange operators with subscribers have been introduced.

The program debugging system makes it possible to debug and correct programs both in a high-level language and on the machine-code level. The appropriate language facilities are available in order to do this. The debugging language contains the following types of operators: condition operators; operators for checking values, registers and variables; print operators; operators for output on displays; tracing operators; operators for calculating temporal characteristics.

The debugging system has a modular structure, which makes it possible to introduce new operators into the debugging language quite easily.

Realization of the Programming Automation and Debugging System. The special features of the operation of this system made it necessary to realize it in two versions. One version has been realized directly in the UMVK, in its technological model (Figure 3a), which is distinguished from the working model by the fact that the PZU has been replaced by an additional operating memory (DZU) so that the programs could be corrected. The translators are contained in the PZU. The translated programs and the constants in the technological UMVK are located in the DZU, although at the same time they can be recovered from the

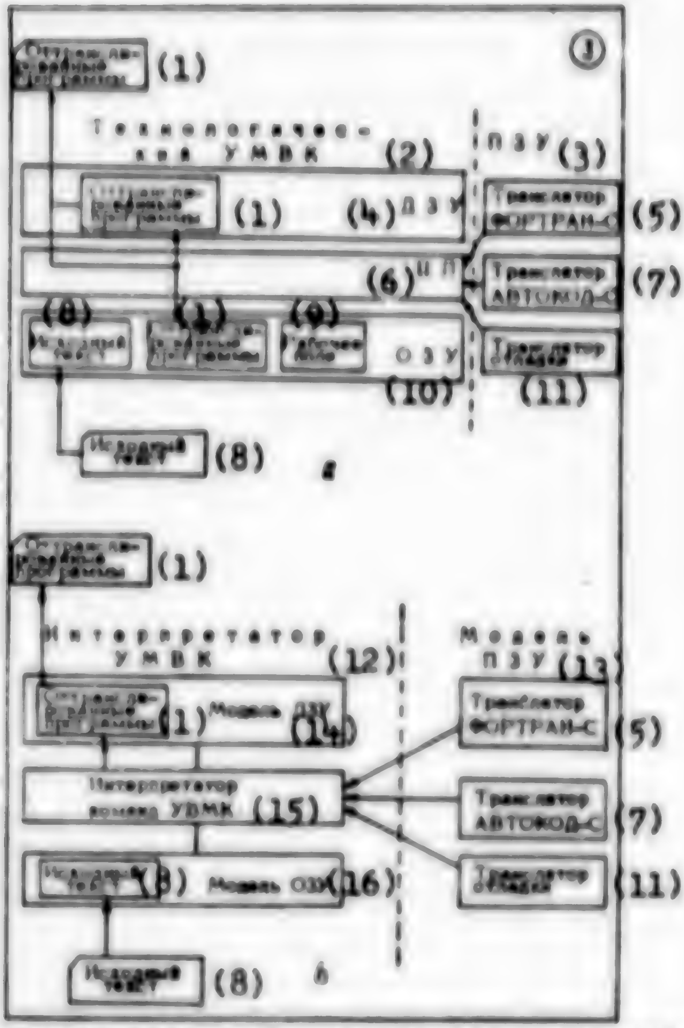

Figure 3. Realization of programming automation and debugging system: a. in UMVK; b. in instrument computer

Key:

1. Translated programs
2. Technological UMVK
3. PZU
4. DZU
5. FORTRAN-C translator
6. TsP
7. AVTOKOD-C translator
8. Original text
9. Working field
10. OZU
11. Debugging translator
12. UMVK interpreter
13. PZU model
14. DZU model
15. UMVK command interpreter
16. OZU model

computer on punched cards. The translation and debugging mode can be either package type or interactive. The interactive mode is provided with a special monitoring system.

The second variant is realized in an instrument computer, for which a BESM-6 high-speed computer has been used (Figure 3b). The instrument computer interprets the UMVK's work. The translators realized in the instrument computer are supplemented with special program optimization units. The translated programs produced in the UMVK and the instrument computer are compatible with each other.

The realization of the translators directly in the UMVK makes it possible to debug programs under actual computer complex operating conditions. Realization of the translators in the instrument computer makes it possible to obtain more efficient programs. The basic development of the UMVK working programs will take place in the instrument computer, while the final debugging of the programs will take place directly in the UMVK.

System for Designing Computation Processes. Optimum organization of the computation processes in a multiprocessor complex makes it possible to achieve a significant reduction in the problem solution time, increase the complex's carrying capacity and achieve maximum loading of its computing capacity. Optimization of a complex's computation processes is carried out both while it is in operation and at the computation process designing stage.

As an illustration, Figure 4 shows the operation of a unit for planning the processing of parallel sections of programs. In Figure 4a the program is shown in parallel-stage form (YaPF). Each YaPF operator is characterized by a number, with the numerator being the operator's serial number, while the denominator is its processing time. The planning unit determines the optimum order of YaPF operator processing, with the dynamic programming method being used as the optimization method. Figure 4b is a graph of the computer complex's states. Each point in the graph corresponds to a possible state of the systems, which is characterized by the numbers of the YaPF operators being processed in each state. Figure 4c depicts temporal diagrams of the processing of YaPF operators in a multiprocessor complex; for ease of visual representation, two processors are shown. Without preliminary planning, when unconnected operators are processed in increasing order of their numbers, for the given YaPF the processing time turned out to be 44. When optimum planning by the dynamic programming method is used, the YaPF processing time is 39, or 10 percent less.

Dynamic Program Debugging. For systems operating on a real time scale, it is very important to conduct dynamic debugging of the entire programmed complex, taking all possible situations into consideration. Such debugging of UMVK programs is realized on an integrated basis. In order to evaluate the

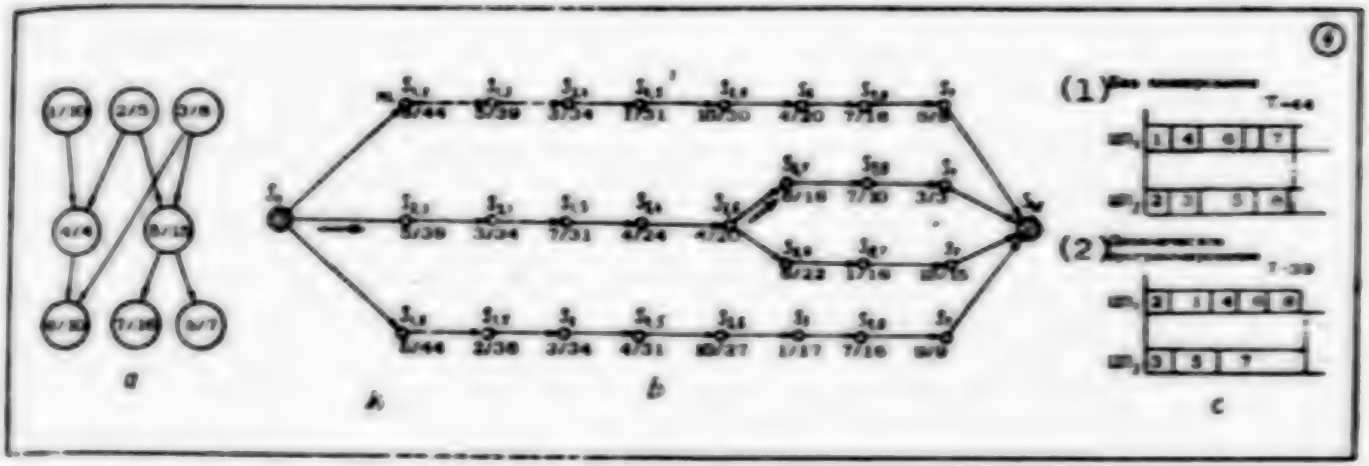

Figure 4. Diagram of planning unit: a. program in parallel-stage form; b. graph of states of computer complex; c. temporal diagram of processing of operators.
Key:
1. Without planning
2. Dynamic programming

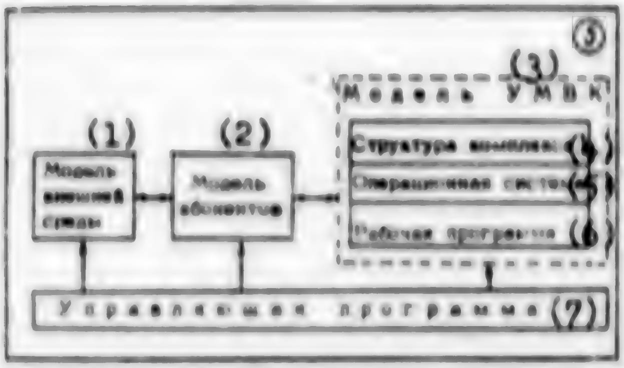

Figure 5. Programmed simulation model of UMVK operation.

Key:

1. Model of external environment
2. Model of subscribers
3. Model of UMVK
4. Structure of complex
5. Operating system
6. Working program
7. Control program

quality of the structure of the UMVK as a whole, with due consideration for the specific organization of the computation process, a programmed simulation model has been developed (Figure 5). This model simulates the operation of the entire complex on a conventionally real time scale. By using the results of statistical tests, it is possible to evaluate the quality of the selected UMVK structure and its carrying capacity, with due consideration for the implementation time for the working programs.

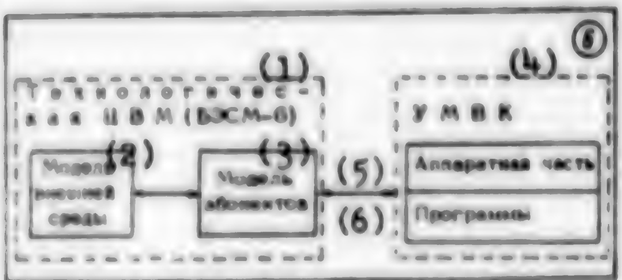

Figure 6. Equipment-programmed simulation complex.

Key:

1. Technological digital computer (BESM-6)
2. Model of external environment
3. Model of subscribers
4. UMVK
5. Equipment section
6. Programs

A simulation model is effective for investigating the operation of a computer complex on the very highest systems level of its representation. In order to shorten the time required and simultaneously improve the quality of the debugging of both the UMVK hardware and software, an equipment-programmed simulation

complex has been developed (Figure 6). This complex consists of a technological BESM-6 high-speed digital computer, which simulates the actual external environment in which the UMVK functions, and the actual UMVK, which operates in accordance with signals generated by the technological digital computer.

By using the results of dynamic tests of the complex's operation and the system for static debugging of the programs, the working programs and the organization of the UMVK's computation process can be corrected.

Conclusion. The technological UMVK software that is being developed will make it possible to reduce the time required to develop and debug the UMVK's working software, improve the organization of its computation process, and debug and test its hardware and software under conditions maximally close to those encountered in actual operation.

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UDC 681.3.51./6.42

THE TYEMP SYSTEM FOR AUTOMATING THE TECHNOLOGY OF THE DEVELOPMENT OF COMPLEXES OF CONTROL PROGRAMS FOR MICROPROCESSORS AND MICROCOMPUTERS [V.V. Lipayev, F.A. Kaganov; excerpts -- pp 33, 36]

In both Soviet and foreign literature, at the present time there are descriptions of a series of systems for automating the programming and debugging of programs and microprograms for microcomputers. In all the known cases ([3,4], for example) the descriptions are of specialized systems intended for some single type of program and a single type of microcomputer. As their number and variety increase, however, we are feeling more and more the effect of the lack of general-purpose technological systems that provide the complete cycle of program and microprogram designing for the entire class of microcomputers and, at the same time, has the capacity for being adapted to the features of a specific computer of this class and the specific utilization conditions that are connected with it.

It has been suggested that this gap be filled with the TYeMP system for automating programming and debugging that was described above and that has a great continuity of ideas and principles with the YaUZA-6 system [6].

Functional Problems in Designing Programs for Microcomputers. The basic principle in the creation of facilities for automating the designing of programs for microcomputers is the principle of cross-systems, which use powerful general-purpose computers as technological computers. This makes it possible to carry out a significant part of the development of the equipment and programming components of microprocessors and microcomputers independently and simultaneously. As a result, the amount of time required to design a microcomputer with its own software is reduced.

The TYeMP system is realized on the basis of a BESM-6 high-speed general-purpose computer with a network of external terminals and with channels that provide the possibility of connection to microcomputers. There are two versions that are used to design programs (TYeMP-P) and microprograms (TYeMP-M) for microcomputers. The functioning of the TYeMP-P relative to the commands of a series MP-K-25 microprocessor has been adjusted and tested. Work is being done to insure the interaction of the TYeMP system with microcomputers

The TYeMP-M version is used to automate the designing of microprograms and has been adjusted to the microcommands of a K-589 microprocessor [8]. As has already been mentioned, the number of microprograms being developed is two-to-three orders less than the number of programs in a microcomputer. This made it possible to isolate a smaller number of functions that needed to be automated in the TYeMP-M system for the designing of microprograms. The basic functions are reduced to the accumulation, storage and correction of microprogram texts in different forms and the adjustment and translation of microprograms. In order to debug the microprograms, an interpreter has been developed that makes it possible to check the execution of the microprograms and investigate the process of the development of microprogrammed control on a BESM-6 general-purpose computer.

Both versions of the TYeMP system are placed on a single BESM-6 systems disk (or tape). The data base is carried on an information disk (or tape) and includes the archives of the original texts of the programs and microprograms, as well as libraries of the resultant and some intermediate data. It is permitted to place and simultaneously use on a single disk data that support the designing of several complexes of programs and microprograms for different projects.

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UDC 681.3.51./6.42

GENERAL-PURPOSE TIME-SHARING OPERATING SYSTEM FOR THE M10 MULTIPROCESSOR DIGITAL COMPUTER [M.I. Belyakov, Ye.M. Grinkrug, L.A. Krol'; excerpt -- p 37]

The M10 digital computer's operating system (OS M10) has been developed for the highly productive M10 multiprocessor digital computer[1] and is used to provide convenient and efficient

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[1] Kartsev, M.A., "The M10 Computer," DAN SSSR (Proceedings of the USSR Academy of Sciences), Vol 245, No 2, 1979, pp 309-312.

user interaction with the computer in the time-sharing and package processing modes.

The OS M10 allows up to 48 problems of the interactive and package types to be solved. Users are presented with developed facilities for the interactive debugging of programs on the level of different algorithmic languages, facilities for organizing (within the framework of a problem) parallel processes with the possibility of synchronizing them, and file system facilities for exchange with peripheral units on the logic level. The system can simultaneously control exchanges with 96 peripheral units of 16 different types.

The OS M10's structure assumes three control levels. The first (internal with respect to the user) level is a supervisor that implements the sharing of the computer's physical resources (time and the central processor's memory, peripheral gear and so on) among problems and the programming support of the input-output process on the physical level. By representing the virtual addresses as physical ones, quantifying the processor's time and controlling the peripheral gear and sets of data, the supervisor creates a virtual computer for each problem, with resources that are utilized for the problem throughout the period of its existence.

The second control level in the system is a monitor that implements for a problem functions similar to those performed by the supervisor for the system as a whole. The monitor is used to share the resources of the virtual computer creation by the supervisor in the interests of the problem. The users of the virtual resources available to the monitor are the intraproblem processes. The functions of creation, synchronization and mutual protection of the processes are imposed on the monitor.

The set of processes in a problem is a tree, the root of which is the so-called working process, which is on the third control level in the system. The service process's functions include interpretation of the command language and development of the standard systems reaction to an interrupt situation in the problem. Users are given the capability of operational selection of the command language.

Let us examine in more detail the control levels listed above and the principles upon which they are realized.

The OS M10 supervisor functions in the privileged mode and consists of an interrupt processing unit, a problem dispatcher, a memory distribution unit and an input-output unit. In addition to this, the supervisor implements the initial system restorations and the reaction to malfunctions in the equipment. The

distribution of the central processor's time is carried out by the problem dispatcher.

The supervisor creates problems as computer resource consumption units on the basis of instructions from the operator's panel (with the exception of the so-called operator problem, which is created by the supervisor in connection with the initial startup of the system and organizes the interaction between the operator and the operating system). The operator can create N interactive and M package problems, providing that N + M 47.

UDC 681.3.06./94

TECHNOLOGY FOR USING THE BESM-6 COMPUTER TO DEVELOP SOFTWARE FOR M400 AND M6000 COMPUTERS [F.A. Popov, G.P. Gruzdev, S.A. Filippov; excerpts -- pp 41, 45]

In this article we discuss one approach to designing programming emulators, describe the M400 emulator and M6000 cross-assembler with mnemonic code that the authors created for the BESM-6 high-speed computer, and present the technological aspects of the debugging of minicomputer programs using the BESM-6.

Both of the systems described above were developed within the framework of the DUBNA monitoring system, which makes it possible to make complete use of all the capabilities of the monitoring system during the debugging of programs: program storage on magnetic tape (disks), their editing in the package mode and call-up for translation from the tape (disk). Special note should be taken of the capability of using the BESM-6 computer's dialog systems, one of which is the DIMON system that was developed at the USSR Academy of Science's Institute of the Problems of Mechanics [2].

The DIMON is used to formulate user files in a common disk package, to edit these files and to start the calculations for a problem. All of these operations can be performed in the dialog mode, using a teletype or a "Videoton-340" display. The DIMON makes it possible to store the results of the calculations in one of the files, which gives the user the capability of recalling them on a terminal at a later time. The program debugging process for a minicomputer, using the emulator, the cross-assembler and the DIMON, is illustrated in the following manner: formation of the files from the programs for the M6000 or M400 computers (from punched cards or a terminal), starting of one of the systems from a terminal, review of the translation (calculation) results, editing of the original programs in the dialog mode, and so on.

Conclusion. The experience gained in working with the systems discussed above showed us that their use, in combination with the powerful servicing capabilities of the BESM-6 computer, increases the productivity of the labor of minicomputer users by several times, while the time expended on the realization of the emulator and cross-assembler together (about 1.5 man-years) is not great in comparison with the advantages they provide. Besides this, the time required can then be reduced significantly during the development of new systems, since the M400 emulator's structure makes it possible to use it as the nucleus of a system for automating program development not only for a single specific minicomputer, but also for an entire class of monotypical computers.

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UDC 681.32.06:518.51

ON ONE APPROACH TO THE REALIZATION AND USE OF DEBUGGING MEANS [B.A. Bobrovnikov, V.N. Afanas'yeva; excerpts -- pp 46, 49]

Essence of the Approach and Its Realization. The purpose of this article is to discuss an approach to the realization and use of debugging means that provides the possibility of adjusting them to a user's specific programs. The essence of the approach is that the obtaining of the information that is afforded the programmer and used to adjust the debugging facilities, as well as the adjusting itself, is done automatically by the appropriate software. The source of the information is either the actual text of the program being debugged or data obtained as the program is being implemented on a computer.

It is suggested that the development of the software to back up this approach and realize the functions of analysis of the texts of programs that are being debugged, as well as the selection and collection of the necessary information and the transformation of the texts and the obtained information into a form that is convenient for use, be done on the basis of an RTK [1]. The higher level of efficiency of R-technology in

comparison with other means for the development of programs of a similar type is the result of its special features, which are described in this article, and have been confirmed by 3 years of use of a Unified System RTK operating system in this area.

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NOTICE TO READERS [p 55]

The USSR State Committee for Science and Technology and the USSR Academy of Sciences, in conjunction with a number of ministries and departments, will hold the 1st All-Union Conference on "Data Banks" in Tbilisi in October 1980.

A far-ranging discussion of the problem is being planned, with emphasis on the following areas:
1. General questions on the theory of data banks.
2. Experience in developing and using data banks with Soviet computers.
3. Standardized software for controlling data banks.
4. Distributed data banks.
5. Modeling the structures and components of data base control systems; architecture of data base control systems.
6. Classification and analysis of the use of data base control systems.
7. Technological problems in the programming of data processing using data base control systems.
8. Information retrieval systems.

Those wishing to participate in the conference must send summaries of their reports to the following address no later than 1 March 1980:

111024, Moscow, Aviamotornaya Street, 26/5,
VNIIPOU, Program Committee for the "Data Banks" Conference (telephone 273-34-21 for information).

UDC 681.3.51./6.42

THE STELZ METASYSTEM; PRINCIPLES OF THE EVOLUTIONARY DEVELOPMENT OF PROGRAMMING LANGUAGES [I.V. Vel'bitskiy, A.L. Kovalev; excerpts -- pp 56, 60]

In this article we describe an instrument metasystem that is used for the general-purpose problem orientation of existing languages. With its help it is possible to add new linguistic constructions and STELZ's (standardized notation elements) to an arbitrary programming language that is used as a nucleus. With the help of the metasystem it is possible to achieve full realization of a problem language that can be made as simple as is desired and accessible even for nonprogrammers. By changing in accordance with the demands made on it, a language created in this manner is capable of satisfying the professional inquiries of users in the most nearly complete form.

The STELZ metasystem is realized on computers from the Unified System of Electronic Computers and a BESM-6 high-speed computer with the help of the RTK technological complexes that have been developed for these machines [8,9]. The encoding of the STELZ description diagram is done in the input language of the RTK-R/TRAN complex, it being the case that this allows the use of a significantly simplified version of the language. As is the case with the RTK, the STELZ metasystem automates the work of programmers using R-technology. In contrast to the RTK, the metasystem has a narrower problem orientation and is simplet to operate; the latter fact makes it possible to also recommend it for one completely unfamiliar with R-technology.

UDC 681.3.06./94

PROGRAMMING IN METASYNTACTICAL NOTATIONS [Ye.A. Zhogolev, Ye.A. Pilipets; excerpts -- pp 61, 64-65]

A syntactically controlled program designing system is being developed at Moscow State University's Scientific Research Computer Center [1-3]. The basic idea behind this system is that the program being developed and, in general, any algorithmic information are accumulated in a computer's memory (in the algorithmic base) not in the form of text fragments in some algorithmic languages, but in the form of sequences of substitutions that are derivations of the corresponding fragments in the grammar of some language or another. The substitutions participating in the derivation form a derivation tree of the text that is being constructed that completely determines its syntactical structure. The nodes in the tree are the labeled metavariables of the grammar of the text being constructed. Each substitution connects the tree node corresponding to the left side of the substitution to nodes on the next level that

correspond to the metavariables in the right side of the substitution. Thus, the value of any metavariable is determined by the subtree originating from the node corresponding to it.

Each entry of a metavariable into a substitution causes the connection of a memory unit that represents some area of localization of the substitutions and that insures the possibility of accumulating different values for the same labeled metavariables and in this manner makes it possible to construct a whole new set of programs.

The system being developed will serve a new and extremely original method of programming: programming in metasyntactical notations. The transition to such a programming methods is just as natural a step in the development of programming as the transition from programming in a machine code to programming in symbolic addresses was in its time. This method agrees quite well with the modern trends in the development of programming technology. In particular, the system can be regarded as an instrument system in the technology of structural programming [9]. Besides this, the system that is under development offers maximally flexible possibilities for accumulating and using algorithmic information.

UDC 681.3.51./6.42

TECHNOLOGICAL PLAN FOR THE DEVELOPMENT OF COMPLEX PROGRAM SYSTEMS [S.M. Abramovich, A.A. Dagald'yan; excerpts -- pp 65, 69]

In this article we describe the technology for executing all the stages of the life cycle of a program system based on such concepts and instruments from [1] as complete programming of the activity for the purpose of information exchange, with the programming written in the form of an operating itinerary; the substantiation of planning decisions in the form of variant networks; a concentrated description of dispersed actions using vertical foliation techniques.

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UDC 681.3.06.614

SYSTEM FOR DESIGNING APPLIED LANGUAGE TRANSLATORS FOR SM COMPUTERS [I.B. Martynova; excerpts -- pp 70, 72]

The SITRAN translator designing system is an instrumental, dialog programming system that gives the user the possibility of developing a personally oriented language and producing a translator with this language on an SM-3/4.

There are two levels of SITRAN use: the language development level and the level of utilization of the developed language. On the development level, the user -- in a dialog mode -- develops, tests and realizes the language's grammar. On the use level, a package of SITRAN programs is used to translate programs written in the created language.

The discrimination of two levels of users corresponds to the division of all the users of this system into two classes: the user who develops the language, who must have some knowledge in the field of programming and be familiar with the language FORTRAN-IV or the language of the SM-3/4 macroassembler, since he must write a small program for the use of the developed language that, when combined with the package of SITRAN programs, will constitute a translator of the given language; the user who utilizes the developed language to solve problems in a specific area and who can have the most minimal knowledge in the field of programming.

These two classes of users can obviously be combined in the same person.

SITRAN includes three concepts: a metalanguage, a set of development level commands, and the actual package of programs that constitutes the system.

The package of SITRAN programs is written in FORTRAN-IV and contains about 1,000 operators. During the generation of the system, the user has the capability of selecting the language for conducting the dialog (Russian or English). SITRAN operates under the control of a FOBOS operating system [2] and can be used in computer complexes constructed on the basis of SM-3/4 processors and using no less than 28K bytes of operating memory.

The system described above can be used to develop specialized person- and problem-oriented languages and to develop cross-software for a microcomputer.

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UDC 681.3.06./94

ON THE PROBLEM OF THE DEVELOPMENT OF MOBILE COMPONENTS OF OPERATING SYSTEMS [L.G. Kaminskiy, S.V. Klimenko, A.A. Lebedev, S.A. Polovnikov, Yu.I. Ryabov, A.V. Samarin; excerpts -- pp 72, 76]

In this article we propose a method for creating mobile components of operating systems that is based on the use of a combination of the following means: a high-level language, bootstrap[1] and the basic methods of R-technology [6]. The method is explained on the example of the realization of a mobile version of the interactive context editor that is part of the GEORGE 3(4) operating system [7] of the ICL Series 1900 computer. We develop an approach that is used successfully in the systems described in [8-10], where simplified versions of the operating system and the GEORGE 3(4) editor have been realized on a minicomputer.

During the transfer of the editor from the DEC-10 computer to a BESM-6 high-speed computer, we used the method described above and checked its correctness and practical efficiency.

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[1] It is curious that this term is translated as "raskrutka" in computer literature and "zashnurovka" in physics literature [5].

UDC 62-52:681.3.06

AN ENGINEER'S INSTRUMENTAL SUBSYSTEM AND ITS USE FOR AUTOMATING THE DESIGNING OF CIRCUITS FOR COMPLEX OBJECTS [V.N. Nuzhdin; excerpt -- p 80]

The engineer's instrumental subsystem was developed as a component of the system for the automated designing of electrical equipment for continuous process lines in accordance with the working program of the RSFSR Ministry of Higher and Secondary Specialized Education's "SAPR [Automated Design System] Program." Its use is most advisable for the class of objects having circuits that are characterized by a large number of elements, the presence of standardized, recurring sections, a multiplicity of variants and a small number of standardized cells and characteristics, a complex logical connective between the characteristics of the units, and variability of the set of standardized cells and modules. The subsystem has been tested in connection with the automation of the designing of the basic

circuits of discrete automated machines in process line control systems, as well as the plotting of directional charts and block diagrams of multiconnected automatic control systems. At the present time it is being tested for the formulation of plans for the use of heuristic procedures in search design problems, to produce recognition programs in problems on a nonformal transition from schematic diagrams to mathematical diagrams, and in the organization of teaching programs for the course "Theory of Automatic Control."

UDC 681.3.06./94

REALIZATION OF THE PRS-TRANSLATOR ON AN M400 MINICOMPUTER [A.M. Pokrovskiy, T.V. Rasinskaya, V.S. Churilina; excerpts, pp 90, 93]

Introduction. The programming technology called R-technology [1] that has been developed in recent years is oriented toward large computers (such as the BESM-6 and the Unified System of Electronic Computers). It is obvious that questions of improving the effectiveness of the work done by programmers also faces developers of packages of applied programs for minicomputers. One of the varieties of R-metalanguage is the PRS-metalanguage [2]. In this article we describe the realization on an M400 minicomputer of a syntactically oriented translator with the grammar given in the PRS-metalanguage.

Conclusion. The PRS-translator has been realized in the disk operating system of an M400 minicomputer. The memory volume occupied by the PRS-programs' input and service programs is 14K bytes. The memory volume occupied by the syntactically oriented translation programs is 4K bytes.

This PRS-translator was used to write the YaKOB-YaGTI translator, which is used in the system for automating the designing of electromechanical assemblies.

Experimental operation of the PRS-translator showed that it is advisable to use it for syntactical monitoring and formal translation from one language to another. In connection with this, 2-3 hours of instruction in the PRS-metalanguage is required, while instruction in keypunching and editing takes no more than 1 hour.

UDC 62-52:681.3.06.2

METHODS FOR REALIZING A DATA BASE CONTROL SYSTEM NETWORK ON THE BASIS OF THE MARS-6 ARCHIVE SYSTEM [V.I. Filippov; excerpts -- pp 103, 105]

The realization of general-purpose SUBD's [data base control system] is a complex and laborious process [1] in which it is important to select the correct structure for the system being developed, distinguish the separate development stages, distribute the work in the collective, and use modular programming technology correctly.

In this article we explain the techniques used in the development of the KOMPAS SUBD, which is being realized at the VTs AN SSSR [Computer Center, USSR Academy of Sciences] for the BESM-6 high-speed computer. This is a network-type system with a basic language (languages, to be more precise) based on the propositions of CODASYL [2] and realized on the basis of the MARS-6 micromodular archive system [3].

During the creation of these techniques we formulated the following basic goals, which frequently contradict each other:
independence of the SUBD from the basic language (the possibility of insertion in several languages);
insuring SUBD efficiency, economy of external exchanges, flexibility of data base reorganization;
general transferability of the SUBD to other computers.

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UDC 681.3.51./6.42

MAKROBOL -- AN EXPANDABLE MULTILEVEL SYSTEM FOR INTERACTION WITH A DATA BANK IN PROBLEM-ORIENTED LANGUAGES [L.P. Babenko, Ye.L. Yushchenko; excerpt -- p 106]

The system under discussion, which was developed at the Ukrainian SSR Academy of Sciences' Institute of Cybernetics and has been given the name MAKROBOL, is a package of applied programs for the Unified System of Electronic Computers that is based on the OKA data base control system [2] and the language KOBOL. The system makes it possible to accomplish the operational adaptation of data base processing languages and the traditional files of a Unified System operating system to the requirements of certain groups of nonprogramming (or final) users and to automate the process of realizing or modifying such languages.

UDC 681.3.51./6.42

PROVIDING A UNIFIED PROGRAMMING TECHNOLOGY FOR PROBLEMS OF WORKING WITH DATA BASES WITH DIFFERENT STRUCTURES [L.A. Khodorovskiy, G.M. Taratinskiy; excerpts -- pp 110, 112]

In this article we explain an approach to providing a uniform programming technology for problems of working with data bases of different types through the use of standardization of the intracomputer technology. The basis of the standardization is the reduction of information base handling procedures to the execution of operations on linear hierarchical sets, as well as the development of a general technique for working with incoming documents that are represented by a hierarchical set of lines.

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UDC 62-52:681.3.06.2

STANDARDIZATION OF SOFTWARE FOR DATA BANKS [V.M. Yevseyev, L.V. Kozachkov, O.Yu. Kuz'yu; excerpt]

In this article we present a system for standardizing the software of problem-oriented data banks that has been realized in connection with the designing of the SIRIUS-INFOPLAN system.

UDC (681.3+681.3.06):658.012.011.56

THE START DATA PROCESSING SYSTEM [S.I. Shtitel'man, M.G. Shteynbuk, L.A. Makogon, A.I. Solokhnenko; excerpts -- pp 116, 117, 121]

During the designing of the START system, which was developed as software for the ASUP [automated enterprise management system] of an instrument building plant, the following features of automated data processing systems were taken into consideration: large volumes and complex structures of the information being processed, high mobility of the data processing problems, and high requirements for both the information production rate and its reliability.

As the input language for the system we chose ALGOL-68, which (in our opinion) is the one that is most adequate for data processing problems at the present time. . .

The START system was developed in the information and computer center of an instrument building enterprise in the period 1972-1977. The system was realized on an M4030 computer equipped with an ASVT [modular system of computer technology] disk operating system, version 2.1. The system's volume is about 80,000 ASSYeMBLYeR operators.

The START software consists of the following parts:
a translator of texts in the input language;
an interpreter of the working programs generated by the translator;
an administrative system for controlling the virtual memory;
a set of service programs.

Industrial operation of the START system began in November 1977. Seven subsystems with a total number of more than 50 problems were developed, used experimentally and then introduced into industrial use during 1978.

More than 500K bytes of text was written in ALGOL-68. In connection with this, more than half the programs were created by young specialists who took a short course of instruction in the language and were able to work independently after 3-4 months.

The total volume of the data base for all the subsystems was about 130M bytes.

UDC 681.3.06./94

FORMALIZED SYNTHESIS OF AUTOMATED CONTROL SYSTEM DATA PROCESSING PROGRAMS BY THE METHOD OF SUBSTITUTIONS [G.I. Kal'nish; excerpt -- p 122]

In this article we discuss a method for the formalized synthesis of data processing programs that is called the method of substitutions and that allows for the specific characteristics of programs of that class and also makes it possible to create programs that prove to be efficient relative to the criterion of execution time because of a fundamental change in the technology of their design and functioning.

UDC 681.3.51./6.42

TECHNOLOGY OF THE EXPERIMENTAL USE OF THE HP/2000F COMPUTER FOR THE PREPROFESSIONAL TRAINING OF USERS [N.A. Sadovskaya; excerpt -- p 140]

In this article we explain an experimental approach to the preprofessional training of students to work with computers [1-3]. This work was done at the VTs SO AN SSSR [Computer Center, Siberian Department of the USSR Academy of Sciences] on the HP/2000F computer, with students in the seventh and ninth forms.

Description of an Instruction System Based on the HP/2000F Computer. This third-generation, dialo minicomputer manufactured by Hewlett-Packard has been in use at the VTs CO AN SSSR for 5 years. It makes it possible to perform a broad range of work, from solving numerical problems and processing scientific and technical information to teaching and game simulation. The simplicity of language interaction with it and its operational reliability makes it extremely promising for use in the initial stages of instruction in a school.

The basic educational advantage of a system based on the HP/2000F computer is the possibility of working in the timesharing mode and the possibility of a direct dialog with the user (student or teacher). Up to 32 terminals may be used simultaneously in this system: HP/2749A teletypes equipped with keypunch machines and readers, or HP/2600A alphanumeric displays.

NOTICE TO READERS [p 143]

The regularly scheduled 4th All-Union Symposium on "Problems of Creating Information Form Converters" will be held in Kiev in November 1980.

The purpose of the symposium is to generalize the results of scientific research, planning and design, and technological work that has been done in the field of creating high-productivity information form converters in the last 5 years and to determine areas that need further development. It is planned that review, summary and predictive reports on the following basic questions will be heard at the symposium:
1. Analysis, synthesis, structural organization and modeling of high-productivity converters.
2. Methods for evaluating the efficiency of converters in systems for automating scientific experiments, controlling technological processes, computerized designing and so on, as well as the determine of prospective paths for improving efficiency on the basis of optimization of structures and processing processes and standardization.
3. The microelectronics base of converter equipment and the use of new physical phenomena to improve the technical, metrological and operating characteristics of converters and microprocessors.
4. Functional and computational converters.

Applications and summaries of reports (in three copies), along with author information and critical reviews, should be presented to the Organizing Committee before 25 March 1980. The length of the double-spaced report summaries must not exceed four pages and may have up to 3 figures.

The Organizing Committee's address is:
252207, Kiev, Prospect 40-Letiye Oktyabrya, 142/144,
Institute of Cybernetics, Ukrainian SSR Academy of Sciences,
Organizing Committee of the Symposium "Converters."

Telephone number: 63-83-69. Scientific secretary of the Organizing Committee: V.A. Romanov.

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ABSTRACTS [pp 145, 149, 151]

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METHODS FOR THE AUTOMATED ANALYSIS OF THE CHARACTERISTICS OF PROGRAM COMPLEXES AND DISTRIBUTION OF THE RESOURCES OF COMPUTER FACILITIES' PRODUCTIVITY

Messikh, I.G., Sobkin, S.S., and Shtrik, A.A.

The authors discuss methods and equipment for the automated analysis of the characteristics of program complexes, using the subsystems for calculating temporal characteristics, analyzing structures of algorithms, and calculating productivity that are part of the YaUZA-6 programming and debugging automation system. They describe the techniques for using these means to evaluate carrying capacity and the distribution of productivity resources, as well as to monitor the organization of the interaction of control and information programs when designing large control program complexes. Figures 2; references 3.

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USING R-TECHNOLOGY TO DESIGN INFORMATION RETRIEVAL SYSTEMS

Popov, P.G., and Rodionov, S.T.

The authors explain several features of the designing of information retrieval systems with the help of R-technology. They focus their basic attention on the solution of problems in the diagnostics of input information, automatic formulation of the structure of data bases and their loading, and information retrieval. Figures 7; references 5.

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ORGANIZATION AND REALIZATION OF A PACKAGE OF PROGRAMS FOR DATA INPUT IN A NATURAL LANGUAGE

Rudnev, Ye.A., and Rybakov, F.I.

The authors discuss the organization and realization of a package of programs for the input of documents into an information and computation system in a natural language. They present a developed language for describing input structures and output formats. References 3.

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